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Pig Iron More Active

Lower Prices in All Markets

Sharp Reduction in Virginia Iron—Foreign Rail Inquiries, but Little Home Business

Iron and steel markets have realized no measurable benefit thus far from the Supreme Court decision, though expectation of tangible betterment has grown, as bearings have been taken under the new status. It appears that influences immediately operating upon buyers in some lines have to do with prices, and hesitancy is still a factor.

In actual developments the pig iron market has taken the lead in the past week. The semi-deadlock that has existed for some time as to the basis of sales for the second half of the year has been effectively broken in the buyer's favor. Prices have declined in all markets and some sellers appear willing to sell on the low basis for delivery far into the second half of the year.

In the East the leading Virginia pig iron interests set out to sell 25,000 tons of No. 2 X foundry iron at $12.25 at furnace for third quarter and $12.50 for fourth quarter, as against a nominal price of $13 previously. Sales of about 12,000 tons have been made, chiefly in New England and eastern Pennsylvania. Other Virginia producers have not followed the cut, but some of them will sell at $12.50.

Buffalo iron has been more active in New England and in New York State at lower prices. One good-sized sale to a malleable foundry is reported. Shipments by Erie Canal have made Buffalo iron more sharply competitive in the New York district and at Sound and Hudson Valley points. At Chicago inquiry for 15,000 tons of Northern and Southern grades is pending and sales have been made more freely there as buyers' views have been met.

Further prompt sales of Southern iron are reported at $10.50, while $10.75 has been the basis on deliveries extending over the third quarter.

The total of basic pig iron sales in eastern Pennsylvania last week is now put above 20,000 tons, two lots of 5000 tons and one of 10,000 tons being placed at $14.50 delivered. Other negotiations are pending. In the Central West both Bessemer and basic irons are very quiet. Stocks of all kinds of iron in Ohio and western Pennsylvania furnace yards, including steel companies outside the Steel Corporation, increased about 5000 tons the first half of May to 880,000 tons.

Finished material markets have shown no new tendency. The bar situation is naturally being watched closely. Sales of hard steel bars have been made at 1.25c in the Chicago district, but there is no confirmation of the published report that a round sale of soft steel bars has been made below 1.40c Pittsburgh. Bar iron is on a 1.20c basis at Eastern mill.

Some variations have appeared in hoop prices and 1.40c has been done on desirable business.

For the Panama emergency dams 12,000 tons of

rolled steel and 1000 tons of pig iron for counterweights were taken by the United States Steel Products Company. The structural market is only fairly active. In New York City over 5600 tons was closed last week, while 8700 tons is pending. The American Bridge Company took the steel for the Statler Hotel at Cleveland, 4000 tons. At Chicago the Mallers and Rand-McNally buildings will require 7000 tons.

Wire nail manufacturers have given notice that after June 1 all unfilled tonnage on contracts made some time ago at $1.75 will be charged at $1.80, the present price. Business in wire products is holding up well.

Rail sales are light. One 10,000-ton contract is pending. In the foreign trade inquiries have come up for 54,000 tons for Queensland and 30,000 tons for the Union of South Africa. Bids will be asked on 4000 to 5000 cars, including 1000 for the Queen and Crescent.

The wrought pipe trade is encouraged by a considerable increase in orders over the April rate. A contract has been taken for 100 miles of 8-in. pipe for Mexico and various other orders for gas and oil pipe amount to nearly 100 miles.

In cast-iron pipe several good contracts are pending. San Diego will buy 7500 tons and bids were opened, or will be opened, this week for 16,000 tons for the various boroughs of Greater New York.

Sales of 400,000 tons of non-Bessemer Lake ores are reported, including a contract for 300,000 tons to be delivered over the next three years at Lake Michigan ports. The offer of an Eastern steel company to buy 300,000 tons of Lake ores a year for 5 or 10 years, at about 80 cents a ton below present Mesaba prices, has not yet resulted in business.

A New Dry Blast Method

An interesting paper read before the recent meeting of the Iron and Steel Institute at London dealt with the calcium chloride method of drying air at the blast furnaces of the Differdange Works in Luxemburg. The apparatus is described in a liberal synopsis of the paper given elsewhere in this issue, and the authors' claim of saving in construction, as compared with the cost of refrigerating machinery, is stated, as well as the claim of decreased working cost. The installation, we are told, cost only about one-fourth as much as would have been paid for refrigerating equipment. No details of the blowing tests of dry air at Differdange are given, and in this particular the paper contrasts notably with that of James Gayley on his dry-blast system, presented at the New York meeting of the Iron and Steel Institute in October, 1904. Naturally some questions were asked in the discussion of this joint paper of Felix A Daubinè and Eugene V. Roy at London as to the comparative costs of the freezing and the calcium chloride methods, but these were not answered in the absence of the authors.

J. E. Stead, the well-known British metallurgist, referring to the proposal made 25 years ago to use calcium chloride as a desiccator, said that it was not made practical then because there was no provision for cooling the calcium chloride after it had been heated to expel the moisture taken up from the air. This has now been met, as the article elsewhere shows, there being first an air cooling and then a cooling with water introduced through coils.

The economies of the new method remain to be demonstrated. The apparatus required is on a scale indicating that some revision must be made of the authors' claim of less than 25 per cent. of the cost of refrigerating apparatus. It is suggested further that the use of so many pipes in the "cooling stove" is objectionable, as corrosion would require their frequent replacement. The chief value of the present paper is in emphasizing the economies of dry blast and in showing that blast furnacemen abroad are increasingly interested in securing savings in which thus far only a small minority of American blast furnacemen have taken a practical interest.

Our Trade Balance Due to Our Manufactures

The reestablishment of a distinctly favorable balance in our foreign trade last September, after a decidedly unsatisfactory period, prompts careful study at this season of the year in the hope of reaching a conclusion whether the turn is due chiefly to a revival of heavy crop exports, to the establishment of a much heavier rate in the exportation of manufactured goods, or to a decrease in imports. The presentation of the mere figures of total exports and imports by months, as is so often done, is not always enlightening, for on account of the nature of the business there are tremendous swings in the monthly trade balance. For instance, in the fiscal year 1897 the favorable balance was $286,000,000, while in the next fiscal year it was $614,000,000. The winter exports were not greatly different in the two years, the maximum monthly balance in the first year being $63,000,000, in October, and the maximum in the second $74,000,000, in December, these representing the peaks in the crop movement. The greater difference between the two fiscal years was caused by a difference in the movement of other commodities, in the summer, for in the first year April, May and June showed adverse balances, averaging $12,000,000 per month, while in the second year those same months showed average favorable balances of $49.000,000 per month.

Thus the accumulation of a large favorable balance in the ten months of the present fiscal year is not in itself conclusive as to the showing of the whole fiscal year. It is necessary to trace the exports by commodities in order to determine their character. There are, indeed, several wholly distinct streams, influenced each by its own conditions, which in the aggregate determine the character and extent of our trade balance. Late in 1909 James J. Hill brought out very forcibly the unfortunate trend in our position as to wheat. Mr. Hill's object, of course, was to illustrate the necessity of our practicing intensive farming. He showed in convincing manner that our wheat yield per acre had been steadily decreasing, while our population is increasing and the consumption of wheat per capita has slightly increased. Accordingly the indications were that our wheat production would become wholly inadequate to the needs of the population and there would be pressure to import large quantities, without any good source from which to draw it. It might be urged that before the pinch becomes severe an adjustment will be made, but such reasoning does not apply to the disappearance of our exports of wheat, because that would not produce a severe pinch. The reduction in our exports not only of wheat but of other cereals also is a factor very active at this time and the move-

ment therefore deserves very careful study. To an extent decreased cereal exports are made up by increased exports of manufactured goods, and if that represents a natural trend the showing is good, for the reason that we can hardly contemplate the cereal position continuing to change at the same rate indefinitely, whereby we should eventually come to import large quantities, whereas if the increase in our exports of manufactures is upon a good basis it can be expected to continue indefinitely, and after the change in our cereal position has ceased to exert an adverse influence upon the trade balance.

The monthly trade balance has been as follows, in the present and the last fiscal year, the balance being favorable except where indicated:

	1909-10	1910-11
July	$3,151,402*	$2,688,099*
August	7,342,187*	3,691,929*
September	32,948,265	51,609,130
October	73,023,992	83,662,755
November	53,489,905	76,834,840
December	33,733,470	90,505,449
January	10,791,157	66,581,886
February	5,559,930*	54,155,651
March	19,341,578*	22,876,776
April	811,658*	37,876,094
May	12,245,983	
June	8,011,293	
Ten months' total	$167,780,014	$478,839,898
Twelve months' total	$188,037,290	

*Unfavorable balance.

Each month in the ten which have elapsed of the present fiscal wear shows a better trade balance than the corresponding month a year earlier, last July showing a small improvement, while in each succeeding month there was a larger improvement until February, which showed a gain of $60,000,000, an adverse balance of $6,000,000 being succeeded by a favorable balance of $54,000,000. The March balance was smaller and the April balance still smaller. To a degree this represents the familiar course of the trade years ago, when the crop movement continually swelled the trade balance until some time in the late fall or winter. An examination of the detailed figures, however, shows that in the present fiscal year exports of agricultural products have not been increasing, the total to date being practically the same as in the last fiscal year, and being at the rate of only about $380,000,000 a year. They do not in the slightest degree account for the increase in the favorable trade balance, nor, indeed, could they hope to account for much of it, since they amount altogether to just about the gain in the favorable balance which the past ten months have shown.

As the greatest increase in the favorable trade balance occurred last February, being approximately $60,000,000, it is interesting to observe the details. The increase was made up by a decrease of $8,000,000 in imports and the following increases in exports: Foodstuffs in crude condition, and food animals, $2,000,000; foodstuffs, partly or wholly manufactured, $4,000,000; crude materials for use in manufacturing, $35,000,000; manufactures for further use in manufacturing, $500,000; manufactures ready for consumption, $10,000,000.

The gains in the trade balance in March and April were of the same origin as the gains in March, but were not so extensive, the decrease in imports in April being only $2,000,000, while the gain in exports was nearly $36,000,000.

A glance at the statistics of exports in the eighteen nineties would appear to indicate that our exports of agricultural products have very greatly fallen off, but questions have been raised lately in certain quarters as to the relevancy of various changes which have been made by the government in the method of compiling the statistics and the grouping of the products. Investigation along this line is promised, and for the present it is perhaps not well to attempt any precise comparison. Enough is known, however, to indicate that our exports of agricultural products have greatly decreased since the nineties, while our exports of manufactures have greatly increased.

From the viewpoint of the moment the position is substantially as follows: After a period of generally unsatisfactory trade balances, beginning with February, 1909, and ending with August, 1910, large favorable trade balances have been restored. They have averaged $48,500,000 a month, beginning with last September, against an average of $46,000,000 per month in the calendar years 1898 to 1908, inclusive, that being clearly marked as the period of by far the most favorable trade balances the country ever had. The recent restoration of a large favorable balance is due in small measure to a reduction in imports, in no measure to an increase in exports of agricultural products, and in very large measure to a great increase in manufactures and manufacturers' materials. Crude materials for manufacturing have shown the largest gain, manufactures ready for consumption the next largest, and manufactures for further use in manufacturing the smallest. The obvious conclusion is that we must improve our position for exporting manufactured products. Having lately made progress along this line, there is promise of success to further efforts.

The Massachusetts Eight-Hour Bill Invalid

The Massachusetts Supreme Court has dealt the final blow to an eight-hour bill which has been before the Legislature of that State for two years, and which would have become a law a year ago had it not been for the veto of the Governor.

This legislation has been considered pernicious because it provided that "working more than eight hours in any one day shall be prima facie evidence of the violation of the statute." The Legislature caused the bill to be brought before the Supreme Court for a decision as to its legality. The court holds that the clause quoted is unconstitutional. The decision reads:

> There are many statutes in which the Legislature has enacted that the existence of a fact which ordinarily creates a strong probability of the commission of an offense shall be prima facie evidence of guilt, and such statutes have been held constitutional. The provision of this section of the proposed act differs from those referred to . . . and is not within the principles on which the cited cases rest.
>
> Under this act "in cases where a Saturday half-holiday is given" employees may work more than eight hours on other days of the week. Such cases will be common, and, in all of them, work for a longer time than eight hours on any other day will not indicate a probability of violation of the law. To provide that such a fact shall constitute prima facie evidence that warrants a finding of guilty beyond a reasonable doubt would be contrary to fundamental principles of criminal law.

The bill applied only to employment upon public works by the commonwealth, the county, and such cities and towns as have accepted the provisions of certain earlier acts. No one disputed that the Legislature has the power up to a certain point to direct how the government shall conduct the public business, although it has no power to limit a citizen in the exercise of his right to make contracts and to use his powers. by the enactment of a statute forbidding his

employment for more than eight hours a day, as has been decided by the Supreme Court of the United States.

Correspondence

A Remarkable Boiler Performance

To the Editor.—I have recently read, with a great deal of interest, an article entitled "Economical Fire Room Methods," by F. R. Low, published by the B. F. Sturtevant Company, giving an account of a day recently spent with the consulting engineer of the American Woolen Company, at Lawrence. Among other things, it showed a very low temperature in the stack, which should always occur in every case, and simply emphasizes the necessity of having a stack large enough. It also gives analyses of flue gas made from time to time, which show remarkably well, although I can show plenty just as good made some time ago at the plant of the Packing & Provision Company, Somerville, Mass.

It was from this plant that I got the most complete set of evaporation tests of any plant which I have ever tested. Here they had a very unique method of running the night gang against the day gang, in the boiler room, posting up, at each change of watch, the record made by the previous watch, as a spur to each gang to do a little better than the previous one. It also showed the differences in coal tests made at different periods of the year and the rate of evaporation. Each of these tests were run for comparatively long periods, some of them as great as 221 hr. and some as short at 48 hr., but, at any rate, long enough so as to wipe out all the errors. And they are very interesting, as showing how ordinary commercial firing can be done.

It was during one of these sets of tests, 60 hr. long, that I obtained the unprecedented figure for equivalent evaporation per pound of dry combustible of 13.156 lb. of water, which produced a boiler efficieney, in return tubular boilers, of 82.32 per cent. This plant had neither mechanical draft nor economizers, although I am aware, in other plants, of the advantages of both of these devices, and I put mechanical drafts, for instance, in the plant of the Morse Twist Drill Company, at New Bedford, and the Union Carpet Lining Company, at Watertown, in place of tall chimneys, and get the best results. I would put myself on record for the use of mechanical draft with economizers, requiring a good, strong and steady draft through many corners. It certainly is more reasonable to make a draft mechanically under those circumstances than by wasting a lot of heat up the stack in order to get such draft.

I also agree that the place to save fuel is in the boiler room, and I also prefer to make a fireman myself, out of a good, intelligent man, than attempt to hire one. There is no doubt of the fact that the place to learn firing of a boiler is on a locomotive, where the steam must be kept uniform and where a failure means losing time. Good, intelligent firemen are made on locomotives, but they can also be trained on stationary plants by a man who knows his job, and then they are the best ever.

RESULTS OF BOILER TESTS

Type of boilers—Return flue tubular.			
Number of boilers in use			9
Diameter of boilers, in	2		72
	5		78
	2		84
Length of boilers, ft			17
Width of grate, in	2		78
	5		82
	2		84
Length of grate, in	2		64
	5		72
	2		72
Number of tubes in boilers	2		140
	5		164
	2		186
Diameter of tubes, in			3
Length of tubes, ft			16
Total water heating surface, sq. ft			7288.5
Total grate surface, sq. ft			118.00
Width of air space in grate, in			0.5
Width of metal in grate bars, in			0.5
Distance of grate to sheet, in			23.00
Ratio of water heating surface to grate			61.76 to 1
Area of stack, sq. ft			19.6
Height of stack, ft			175.00
Ratio of stack area to grate			0.166 to 1
Duration of trials, hr	60	60	78
Atmospheric pressure, in	29.40	29.80	29.63
Pressure in boilers, gauge, lb.	77.9	78.15	77.8
Absolute steam pressure, lb.	92.31	92.75	92.32
Chimney draft, in. of water	.283	.257	.364
External air, deg. F	43.4	27.7	28.9
Fire room, deg. F	....	....	....
Steam, deg. F	321.8	322.	321.8
Feed water, deg. F	158.9	168.2	150.9
Escaping gases by metal pyrometer, deg. F	340.6	345.	352.2
Coal consumed, lb	137,407	140,006	177,920
Moisture in coal, per cent	6.12	5.	3.6
Dry coal consumed, lb	129,162.6	133,005.7	171,504.9
Total ash and refuse, lb	16,373.9	9,110.	18,162.4
Ash and refuse in dry coal, per cent	12.7	6.85	10.6
Ash and refuse by analysis, per cent	7.9	5.	6.18
Combustible, lb	112,788.7	123,895.7	153,342.5
Moisture in steam, per cent.	2.70	2.76	2.98
Water apparently evaporated lb.	1,399,535.2	1,451,605.85	1,817,430.56
Water actually evaporated, corrected for moistures, lb.	1,361,757.74	1,411,541.47	1,763,271.
Water evaporated into dry steam from 212 deg. F., lb.	1,484,315.93	1,525,876.36	1,936,072.55
Equivalent water evaporated into dry steam for 212 deg. per hour, lb	24,738.6	25,431.27	24,821.4
Total heat derived from coal in B.t.u	10,764.5	10,737.	10,580.1
British thermal units per analysis of coal	13,078	14,028.6	13,514.3
Efficiency of boilers, per cent	82.32	76.53	78.29
Water actually evaporated per lb. of dry coal, lb	10.54	10.61	10.28
Equivalent water evaporated per lb. of dry coal for 212 deg., lb	11.48	11.47	11.29
Equivalent evaporation per lb. of combustible for 212 deg., lb.	13.156	12.31	12.616
Dry coal actually burned per sq. ft. of grate per hr., lb.	18.22	18.79	18.6
Combustible actually burned per sq. ft. of grate per hr., lb.	15.93	17.5	16.66
Combustible actually burned per sq. ft. water heating surface, lb	0.258	0.283	0.269
Water evaporated from and at 212 deg. per hr. per sq. ft. of grate surface, lb	209.6	215.5	210.3
Water evaporated from and at 212 deg. per hr. per sq. ft. of water heating surface, lb	3.39	3.49	3.4
On a basis of 30 lb. water per hour from feed at 100 deg. F. into steam at 70-lb. pressure, hp	877.14	900.39	825.06
Builders' rating, hp	1400.	1400.	1400.
Per cent developed below rating	37.25	35.7	41.
Dry coal per hour per hp developed, lb	2.46	2.46	2.65
Cost per ton (2240 lb.) of combustible	$3.78	$3.78	$4.12
Coal per 1000 hp per hr., developed	$4.15	$4.15	$4.87
Cost per 1000 lb. steam	$14.7	$14.7	$16.27
Carbonic acid gas, per cent.	11.2	9.88	6.8
Oxygen, per cent	7.15	9.3	12.18
Carbonic oxide, per cent	0.8	0.3	0.25
Nitrogen, per cent	80.5	80.4	80.5
Flue gas per lb. of carbon, lb.	22.3	25.23	36.2
Heat balance, Dr.			
In coal (all referred to 32 deg. F.), units	1000.	1000.	1000.
In water, units	105.7	106.9	94.3
In air, units	4.	0	0
	1109.7	1106.9	1094.3
Heat balance, Cr.			
In dry steam, units	982.4	927.	935.
In flue gas, extra temp. of gases, units	113.9	130.7	103.5
In evaporation of water in coal, units	5.1	3.9	2.8
In priming or moisture in steam, units	2.2	3.14	2.3
In radiation and unaccounted for	6.1	42.16	50.6
	1109.7	1106.9	1094.3
Heat balance 1897 method			
Heat absorbed in useful work, per cent	80.	77.2	79.6
Loss in moisture and hydrogen in coal, per cent	3.55	3.6	3.5
Loss in heat in chimney gases, per cent	9.9	12.5	16.0
Loss in incomplete combustion of carbon, per cent	3.9	1.86	1.7
Loss in radiation and unaccounted for	2.65	4.84	0.0
	100.00	100.00	100.18

WILLIAM O. WEBBER.

BOSTON, MASS., May 11, 1911.

To Market American Machinery Abroad

A company that gives promise of being an important factor in the marketing of American machinery abroad has been incorporated at Albany, N. Y., under the title of the Allied Machinery Company of America, by interests directly connected with the National City Bank of New York. The incorporators, most of whom are important officials in the bank, have far-reaching plans for extending American business in foreign countries. They have already made arrangements with between 35 and 40 manufacturers of mechanical equipment in this country, most of whom are makers of machine tools and other metal working machinery, whereby the new company will take charge of the selling arrangements for their clients abroad. It is their purpose to operate with the National City Bank so as to arrange for foreign banking facilities, and this plan will give American manufacturers an opportunity to sell their product direct in a manner that they have not been afforded before.

The National City Bank, through its broad connections, now has a powerful influence in Europe and the Orient, where it is an important factor in the arrangement of foreign loans. It is understood that the purposes of the projectors of the company are to use this influence in increasing the foreign sale of American-made machinery.

Captain G. L. Carden, of the United States revenue cutter service, who was formerly connected with the Department of Commerce and Labor, and whose reports on machine tool making abroad have attracted great attention, is on a leave of absence from the government and is prominently associated with the organizers of the company. Samuel McRoberts, a vice-president of the National City Bank, is president of the Allied Machinery Company, and F. A. Vanderlip, president of the bank, and J. T. Talbert, another vice-president, are deeply interested in the plan. Captain Carden and Mr. McRoberts will leave for Europe within a week on business connected with the enterprise.

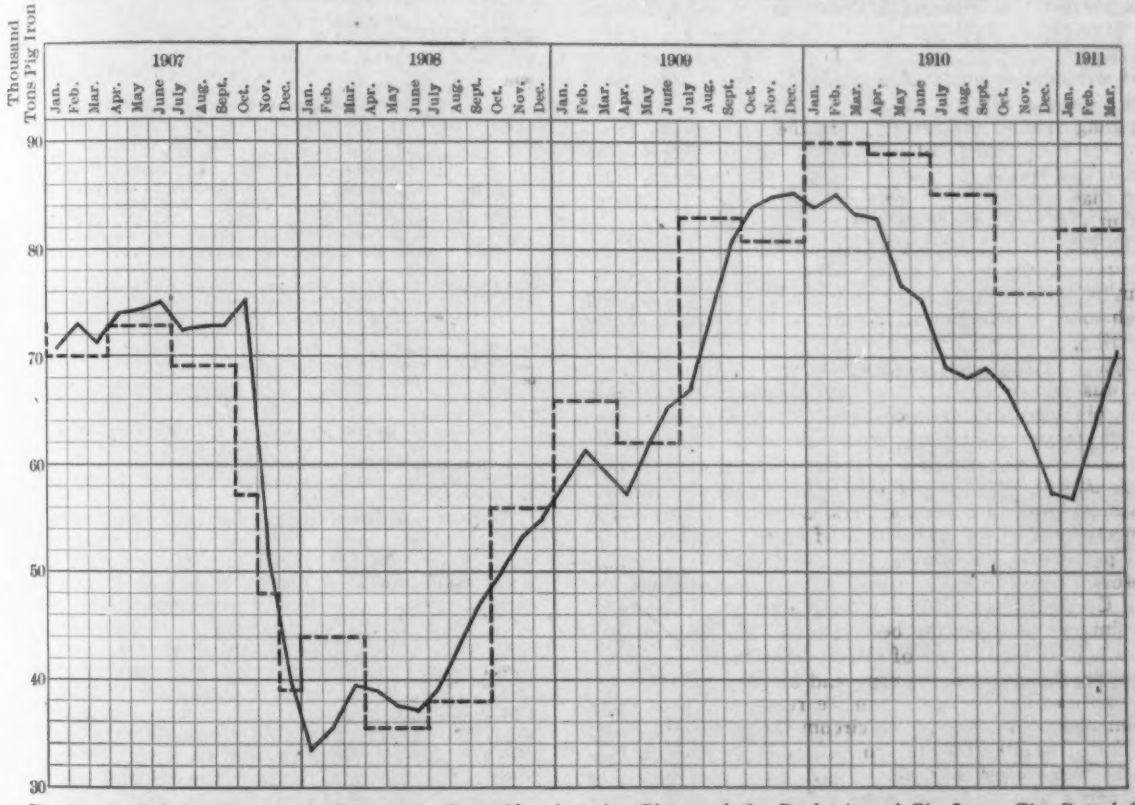
The Bessemer Gas Engine Company, Grove City, Pa., has received an order from the Air Tight Steel Tank Company, Pittsburgh, for an 85-hp. gas engine, and also an order from the Frick Company, Waynesboro, Pa., for a 20-h.p. gas engine to be used in connection with refrigerating machinery, the installation to be made in Texas.

Pig Iron Output the Criterion

Its Fluctuations Correspond with Those in Orders for Machinery Supplies

An officer of a large manufacturing corporation, the products of which go to a vast variety of industries and trades, has plotted the curve of the company's deliveries from January 1, 1907, to April 1 last, and compared it with the chart published in *The Iron Age* of April 6, 1911, page 824, showing the course of pig iron production in the United States in that period. The two curves are given in the accompanying chart.

The plant in question manufactures wood screws, machine screws, taps and dies, screw machine products, chair and stove rods, stove bolts, tire bolts, cap screws, set screws, small nuts, rivets and burrs, hanger bolts, small brass castings and hardware specialties. The list of consumers is of necessity greatly diversified.



Curves Showing the Relation Between the Output of a Large Manufacturing Plant and the Production of Pig Iron. The Dotted Curve Indicates the Former and the Solid One the Latter.

The immediate and simultaneous response of general trade to the conditions which govern the iron market is graphically demonstrated by this common experience. The manufacturer's curve was plotted by three months' periods, with the exception of the last quarter of 1907. But the suggestion is almost as strong as if the flowing curve based on monthly intervals were given.

The investigation brought out one interesting fact—that during the falling off of shipments in the last six months of 1910 the average price received for the products increased. One reason for this was that a larger percentage of sales was for the higher priced products. But this was not the whole reason. Doubtless the fact may be attributed in no small part to the sound conditions underlying all business in the past year and the large extent to which the purchases made were prompted by imperative need.

A steel bracelet around the city forms a special feature of the improved gas distributing facilities which have been in process of development for San Francisco. It is a 16-in. pipe line, 7½ miles long, for carrying high-pressure gas to feed at distributed points the ordinary low-pressure gas system. It is stated that it has been kept at 60-lb. pressure for days at a time and may be counted on as one of the steps in high-pressure gas distribution, calculated to erase the common gas holder and its desolated contiguous area.

The Iron and Metal Markets

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics.

At date, one week, one month and one year previous.

	May 24, 1911.	May 17, 1911.	April 26, 1911.	May 25, 1910.
PIG IRON, Per Gross Ton:				
Foundry No. 2 standard, Philadelphia	$15.50	$15.50	$15.50	$17.00
Foundry No. 2, Valley Furnace	13.75	13.75	13.75	15.00
Foundry No. 2 Southern, Cincinnati	13.75	13.75	14.25	14.75
Foundry No. 2, Birmingham, Ala	10.50	10.50	11.00	11.50
Foundry No. 2 local, at furnace, Chicago*	15.00	15.00	15.00	17.00
Basic, delivered, eastern Pa.	14.50	14.50	15.00	16.25
Basic, Valley furnace	13.25	13.25	13.75	15.00
Bessemer, Pittsburgh	15.90	15.90	15.90	16.90
Gray forge, Pittsburgh	14.15	14.15	14.40	15.90
Lake Superior charcoal, Chicago.	17.00	17.00	17.50	18.50
COKE, CONNELLSVILLE, Per Net Ton, at oven:				
Furnace coke, prompt shipment.	1.45	1.45	1.55	1.70
Furnace coke, future delivery.	1.75	1.75	1.75	1.80
Foundry coke, prompt shipment	1.75	1.75	2.00	2.25
Foundry coke, future delivery.	2.00	2.10	2.20	2.40
BILLETS, &c., Per Gross Ton:				
Bessemer billets, Pittsburg	23.00	23.00	23.00	25.50
Forging billets, Pittsburgh	28.00	28.00	28.00	31.00
Open hearth billets, Philadelphia	25.40	25.40	25.40	29.00
Wire rods, Pittsburgh	29.00	29.00	29.00	32.00
OLD MATERIAL, Per Gross Ton:				
Iron rails, Chicago	14.50	14.75	14.25	17.50
Iron rails, Philadelphia	16.75	16.75	17.00	20.00
Car wheels, Chicago	12.75	12.75	13.25	15.50
Car wheels, Philadelphia	13.00	13.00	13.00	15.00
Heavy steel scrap, Pittsburgh	13.00	12.50	12.50	15.25
Heavy steel scrap, Chicago	10.25	10.25	11.50	13.50
Heavy steel scrap, Philadelphia.	13.00	13.00	13.00	14.50
FINISHED IRON AND STEEL, Per Pound:	Cents.	Cents.	Cents.	Cents.
Bessemer steel rails, heavy, at mill	1.25	1.25	1.25	1.25
Refined iron bars, Philadelphia	1.27	1.30	1.32½	1.52½
Common iron bars, Chicago	1.22	1.22½	1.25	1.47½
Common iron bars, Pittsburgh	1.30	1.30	1.35	1.55
Steel bars, tidewater, New York	1.56	1.56	1.56	1.61
Steel bars, Pittsburgh	1.40	1.40	1.40	1.45
Tank plates, tidewater, New York	1.56	1.56	1.56	1.66
Tank plates, Pittsburgh	1.40	1.40	1.40	1.50
Beams, tidewater, New York	1.56	1.56	1.56	1.66
Beams, Pittsburgh	1.40	1.40	1.40	1.50
Angles, tidewater, New York	1.56	1.56	1.56	1.66
Angles, Pittsburgh	1.40	1.40	1.40	1.50
Skelp, grooved steel, Pittsburgh	1.30	1.30	1.30	1.50
Skelp, sheared steel, Pittsburgh.	1.35	1.35	1.35	1.60
SHEETS, NAILS AND WIRE, Per Pound:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, Pittsburgh	2.20	2.20	2.20	2.40
Wire nails, Pittsburgh†	1.80	1.80	1.80	1.80
Cut nails, Pittsburgh	1.60	1.60	1.65	1.80
Barb wire, galvanized, Pittsburgh†	2.10	2.10	2.10	2.10
METALS, Per Pound:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York	12.37½	12.25	12.37½	13.00
Electrolytic copper, New York.	12.12½	12.00	12.12½	12.87½
Spelter, New York	5.50	5.50	5.50	5.30
Spelter, St. Louis	5.20	5.20	5.30	5.15
Lead, New York	4.37½	4.40	4.42½	4.37½
Lead, St. Louis	4.22½	4.25	4.27½	4.22½
Tin, New York	44.60	43.00	42.50	33.25
Antimony, Hallett, New York	9.00	9.00	9.00	8.12½
Tin plate, 100 lb. box, New York	3.94	3.94	3.94	3.84

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

†These prices are for largest lots to jobbers.

Prices of Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.; New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11c.; Cleveland, 10c.; Cincinnati, 15c.; Indianapolis, 17c.; Chicago, 18c.; St. Paul, 32c.; St. Louis, 22½c.; New Orleans, 30c.; Birmingham, Ala., 45c. Rates to the Pacific Coast are 80c. on plates, structural shapes and sheets, No. 11 and heavier; 85c. on sheets, Nos. 12 to 16; 95c. on sheets, No. 16 and lighter; 65c. on wrought boiler tubes.

Structural Material.—I-beams and channels, 3 to 15 in., inclusive, 1.40c. to 1.45c., net; I-beams over 15 in., 1.50c. to 1.55c., net; H-beams over 8 in., 1.55c. to 1.60c.; angles, 3 to 6 in., inclusive, ¼ in. and up, 1.40c. to 1.45c., net; angles over 6 in., 1.50c. to 1.55c., net; angles, 3 in., on one or both legs, less than ¼ in. thick, 1.45c., plus full extras as per steel bar card effective September 1, 1909; tees, 3 in. and up, 1.45c., net; zees, 3 in. and up, 1.40c. to 1.45c., net; angles, channels and tees, under 3 in., 1.45c., base, plus full extras as per steel bar card of September 1, 1909; deck beams and bulb angles, 1.70c. to 1.75c., net; hand rail tees, 2.50c.; checkered and corrugated plates, 2.50c., net.

Plates.—Tank plates, ¼ in. thick, 6¼ in. up to 100 in. wide, 1.40c. to 1.45c., base. Following are stipulations prescribed by manufacturers, with extras to be added to base price (per pound) of plates:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated February 6, 1903, or equivalent, ¼ in. thick and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per square foot, are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼-in. thick on edge, or not less than 11 lb. per square foot, to take base price. Plates over 72 in. wide ordered less than 11 lb. per square foot down to the weight of 3-16-in. take the price of 3-16-in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

Gauges under ¼-in. to and including 3-16-in. on thinnest edge	$0.10
Gauges under 3-16-in. to and including No. 8	.15
Gauges under No. 8 to and including No. 9	.25
Gauges under No. 9 to and including No. 10	.30
Gauges under No. 10 to and including No. 12	.40
Sketches (including all straight taper plates) 3 ft. and over in length	.10
Complete circles, 3 ft. in diameter and over	.20
Boiler and flange steel	.10
"A. B. M. A." and ordinary firebox steel	.20
Still bottom steel	.30
Marine steel	.40
Locomotive firebox steel	.50
Widths over 100 in. up to 110 in., inclusive	.05
Widths over 110 in. up to 115 in., inclusive	.10
Widths over 115 in. up to 120 in., inclusive	.15
Widths over 120 in. up to 125 in., inclusive	.25
Widths over 125 in. up to 130 in., inclusive	.50
Widths over 130 in	1.00
Cutting to lengths or diameters under 3 ft. to 2 ft., inclusive	.25
Cutting to lengths or diameters under 2 ft. to 1 ft., inclusive	.50
Cutting to lengths or diameters under 1 ft	1.55

No charge for cutting rectangular plates to lengths 3 ft. and over.

TERMS—Net cash 30 days.

Sheets.—Makers' prices for mill shipments on sheets in carload and larger lots, on which jobbers charge the usual discounts for small lots from store, are as follows: Blue annealed sheets, Nos. 3 to 8, U. S. standard gauge, 1.55c.; Nos. 9 and 10, 1.65c.; Nos. 11 and 12, 1.70c.; Nos. 13 and 14, 1.75c.; Nos. 15 and 16, 1.85c. One pass, cold rolled, box annealed sheets, Nos. 10 to 12, 1.85c.; Nos. 13 and 14, 1.90c.; Nos. 15 and 16, 1.95c.; Nos. 17 to 21, 2c.; Nos. 22, 23 and 24, 2.05c.; Nos. 25 and 26, 2.10c.; No. 27, 2.15c.; No. 28, 2.20c.; No. 29, 2.25c.; No. 30, 2.35c. Three pass, cold rolled sheets, box annealed, are as follows: Nos. 15 and 16, 2.05c.; Nos. 17 to 21, 2.10c.; Nos. 22 to 24, 2.15c.; Nos. 25 and 26, 2.20c.; No. 27, 2.25c.; No. 28, 2.30c.; No. 29, 2.35c.; No. 30, 2.45c. Galvanized sheets, Nos. 10 and 11, black sheet gauge, 2.20c.; Nos. 12, 13 and 14, 2.30c.; Nos. 15, 16 and 17, 2.45c.; Nos. 18 to 22, 2.60c.; Nos. 23 and 24, 2.70c.; Nos. 25 and 26, 2.90c.; No. 27, 3.05c.; No. 28, 3.20c.; No. 29, 3.30c.; No. 30, 3.50c. Painted roofing sheets, No. 28, $1.55 per square. Galvanized sheets, No. 28, $2.75 per square for 2½-in. corrugations. All above prices are f.o.b. Pittsburgh, terms 30 days net, or 2 per cent. cash discount 10 days from date of invoice.

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card on wrought pipe, in effect from October 1:

	Steel—Black.	Steel—Galv.	Iron—Black.	Iron—Galv.
Butt Weld.				
1 to 1½ in	..	..	49	43
½ in	75	63	71	59
¾ to 1¼ in	79	69	75	65
2 to 3 in	80	70	76	66
Lap Weld.				
2 in	76	66	72	62
2½ to 4 in	78	68	74	64
4½ to 6 in	77	67	73	63
7 to 12 in	75	59	71	55
13 to 15 in	51½	..	..	..
Butt Weld, extra strong, plain ends, card weight.				
⅛, ¼, ⅜ in	69	59	65	55
½ in	74	68	70	64
¾ to 1¼ in	78	72	74	68
2 to 3 in	79	73	75	69
Lap Weld, extra strong, plain ends, card weight.				
2 in	75	69	71	65
2½ to 4 in	77	71	73	67
4½ to 6 in	76	70	72	66
7 to 8 in	69	59	65	55
9 to 12 in	64	54	60	50
Butt Weld, double extra strong, plain ends, card weight.				
½ in	64	58	60	54
¾ to 1¼ in	67	61	63	57
2 to 3 in	69	63	65	59

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Lap Weld, double extra strong, plain ends, card weight.				
2 in.	65	59	61	55
2½ to 4 in.	67	61	63	57
4½ to 6 in.	66	60	62	56
7 to 8 in.	59	49	55	45

Plugged and Reamed.

1 to 1¼, 2 to 3 in. Butt Weld } Will be sold at two (2) points lower basing (higher price) than merchant or card weight pipe. Butt or lap weld, as specified.

2, 2½ to 4 in. Lap Weld }

The above discounts are for "card weight," subject to the usual variation of 5 per cent. Prices for less than carloads are three (3) points lower basing (higher price) than the above discounts.

Boiler Tubes.—Discounts on lap welded steel boiler tubes to jobbers in carloads are now as follows:

	Steel.
1¼ to 2¼ in.	65
2½ in.	67½
2¾ to 3¼ in.	70
3½ to 4½ in.	72½
5 and 6 in.	65
7 to 13 in.	62½

Less than carloads to destinations east of the Mississippi River will be sold at delivered discounts for carloads lowered by two points for lengths 22 feet and under; longer lengths f.o.b. Pittsburgh. Usual extras to jobbers and boiler manufacturers.

Wire Rods and Wire.—Bessemer, open hearth and chain rods, $29. Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days, or 2 per cent. discount in 10 days, carload lots, to jobbers, annealed $1.60, galvanized $1.90; carload lots, to retailers, annealed $1.65, galvanized $1.95. Galvanized barb wire, to jobbers, $2.10; painted, $1.80. Wire nails, to jobbers, $1.80.

The following table gives the prices to retail merchants on wire in less than carloads, including the extras on Nos. 10 to 16, which are added to the base price:

Fence Wire, Per 100 Lb.							
Nos.	0 to 9	10	11	12 & 12½	13	14	15	16
Annealed	$1.75	1.80	1.85	1.90	2.00	2.10	2.20	2.30
Galvanized	2.05	2.10	2.15	2.20	2.30	2.40	2.80	2.90

Market and Stone Wire in Bundles, Discount from Standard List.

Bright and Annealed:
- 9 and coarser....80
- 10 to 18....80 and 10
- 19 to 26....80 and 10 and 2½
- 27 to 36....80 and 5

Galvanized:
- 9 and coarser....75 and 10
- 10 to 16....75 and 10
- 17 to 26....72½ and 10
- 27 to 36....72½

Coppered or Liquor Finished:
- 9 and coarser....75 and 10
- 10 to 26....75 and 10
- 27 to 36....70 and 10 and 5

Tinned:
- 6 to 18....75 and 10 and 10

Pittsburgh

PARK BUILDING, May 24, 1911.—(*By Telephone.*)

Pig Iron.—The market is dull and neglected, with no new inquiry. Local foundrymen are attending the sessions of the convention of the American Foundrymen's Association here this week, and state that there is considerable large work under way, but it is very slow in developing. Bessemer pig iron is still being offered by dealers at $14.75 to $14.85, Valley furnace, but furnacemen are holding for $15. Not enough new business is coming out in pig iron to test prices. We quote as follows: Bessemer pig iron, $15 nominally; malleable Bessemer, $13.75; basic, $13.25; No. 2 foundry, $13.50 for prompt and $13.75 for forward delivery; gray forge, $13.25, all at Valley furnace, the freight rate to the Pittsburgh district being 90c. a ton.

Steel.—There is no new business in billets or sheet bars, and specifications against contracts from sheet and tinplate mills are only fair. Small lots of open-hearth steel are still being offered by small makers below the regular prices made by the larger mills. Regular prices are as follows: Bessemer and open-hearth billets, 4 x 4 in. and up to, but not including, 10 x 10 in., at $23, base, and sheet and tin bars in 30-ft. lengths, $24; 1½-in. billets, $24; forging billets, $28, base, usual extras for sizes and carbons—all prices, f.o.b. Pittsburgh or Youngstown districts, freight to destination added.

(*By Mail.*)

Sentiment in the local iron trade has undergone a material change, being more optimistic now than at any time for the past two or three months. The Standard Oil decision is regarded as having partially clarified the situation, and with reasonable assurance of heavy crops it is expected that trade should show some improvement over the next two or three months, with a more decided change for the better about September. The pipe and scrap trades have shown considerable activity, some fairly heavy sales of line pipe having been made, while large transactions in heavy steel scrap for forward delivery were consummated at 50 cents a ton higher than dealers were quoting one week ago. The leading wire and wire nail makers have taken the situation in hand and have notified the large trade that, taking effect June 1, all unfilled tonnage on contracts made some time ago will be charged for at the present prices and that no orders will be booked at a lower figure than $1.80 for wire nails on and after that date. The trade is gradually accepting the belief that no revision of prices on finished iron and steel will be made, and as a result there is more confidence in the future. The weakest spot in the whole situation is in pig iron, stocks at the furnaces being heavy, while the new demand is very light. There is no new inquiry for steel to speak of, but regular prices are being pretty firmly held.

Ferromanganese.—No sales are reported. We continue to quote 80 per cent. foreign at $36.50 to $36.75, Baltimore, the freight rate to Pittsburgh district being $1.95 a ton.

Ferrosilicon.—A leading local consumer is in the market for 200 to 250 tons of 50 per cent., but there is not much new inquiry. We quote 50 per cent. at $52.50 to $53, Pittsburgh, for delivery through the third quarter; 10 per cent. blast furnace silicon, $22; 11 per cent., $24, and 12 per cent., $25, f.o.b. cars, Ashland and Jisco furnaces.

Muck Bar.—The market continues dull. We quote best grades of pig iron muck bar nominally at $28.50 to $29, Pittsburgh.

Skelp.—In spite of lack of new demand prices are fairly firm. We quote: Grooved steel skelp, 1.30c.; sheared steel skelp, 1.35c.; grooved iron skelp, 1.60c. to 1.65c., and sheared iron skelp, 1.70c. to 1.75c., all for delivery at consumers' mills in the Pittsburgh district, usual terms.

Wire Rods.—A sale of 300 tons of Bessemer wire rods for June and July shipment is reported on the basis of $28. New inquiry is light. We quote Bessemer, open hearth and chain rods at $29, Pittsburgh.

Steel Rails.—There is some active inquiry for standard sections amounting to 20,000 tons or over, which bear the earmarks of live business that may be closed in a short time. The Carnegie Steel Company sold in the past week 500 tons of light rails to a coal company and 300 tons to a lumber interest, and in addition has taken several fairly large orders of standard sections for export. Prices on light rails are as follows: 12-lb. rails, 1.25c.; 16, 20 and 25 lb., 1.21c. to 1.25c.; 30 and 35 lb., 1.20c., and 40 and 45 lb., 1.16c. The prices are f.o.b., at mill, plus freight, and are the minimum of the market on carload lots, small lots being sold at a little higher price Standard sections are held at 1.25c. per pound.

Structural Material.—No local jobs have been placed in the past week. An inquiry is out from the city of Pittsburgh for about 500 tons for an extension to the Smithfield street bridge, and there is also an inquiry for 800 tons for the proposed Peoples Theater in this city. New inquiries are better and considerable local work is in sight, some of which is expected to be placed in the very near future. Prices are reported firmer and we quote beams and channels up to 15-in. at 1.40c., Pittsburgh.

Plates.—No important orders for steel cars have been placed, but the Queen & Crescent route is in the market for 1000 steel hopper cars. On May 26 bids will be opened for 4500 tons of plates for the Los Angeles aqueduct. A little better inquiry is reported for plates and prices are said to be firmer. Narrow sizes of sheared plates are being sold at about 1.35c., while tank plate ¼ in. and heavier, in the wider sizes, is held at 1.40c., Pittsburgh.

Sheets.—Conditions in the sheet trade do not show much betterment, the new demand being rather quiet, being mostly for small lots to cover actual needs. Specifications against contracts are not satisfactory and have not been for some time. Prices in the main are pretty well observed, although in some sections some mills are still slightly shading what are regarded as regular quotations and will be found on a previous page.

Tin Plate.—In the past two weeks specifications from the can makers have been quite heavy and ship-

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ments over the next 60 days or more to this class of consumers are expected to be very large. The new demand is quiet, as this is the dull season in the tin plate trade as far as new buying is concerned. The American Sheet & Tin Plate Company on Monday put its Shenango Works at New Castle, Pa., containing 30 hot mills, on full time, while its New Castle Works, also at New Castle, containing 20 hot mills, is running to full capacity. It is estimated that about 75 per cent. of tin plate capacity is active at present, showing a considerable gain over the conditions of a month ago. Prices are firm and we continue to quote 100 lb. coke plates for delivery over remainder of this year at $3.70 per base box f.o.b. Pittsburgh.

Bars.—As a result of the recent conference of makers of steel bars, the market to-day is firmer than it has been for some time, but whether the 1.40c. price can be maintained, in view of the very low prices ruling for hard bars for concrete reinforcing purposes and also on iron bars, is problematical. So far the implement makers and the wagon builders have not shown much interest in the market or in prices by making contracts for their requirements for the year beginning July 1. In previous years a very heavy tonnage of steel bars has been under contract prior to June 1, but so far this year nothing has been done. The new demand for both iron and soft steel bars is quiet, but is fairly active for hard steel bars. We continue to quote soft steel bars rolled from billets at 1.40c., and common iron bars at 1.30c., f.o.b., Pittsburgh.

Shafting.—A meeting of the shafting makers was held in New York last week. Discounts of 57 per cent. off in carload and larger lots, and 52 per cent. in smaller lots, are continued, but are not always rigidly held. The new demand is quiet, being mostly for small lots to cover actual needs, and specifications against contracts have not been large.

Spelter.—The market is weak and dull. We quote prime grades of Western at 5.17½c., East St. Louis, equal to 5.30c., Pittsburgh.

Hoops and Bands.—There has been some unevenness in prices of hoops recently, 1.40c. having been done on desirable contracts. The new demand is quiet, and specifications against contracts on both hoops and bands have not been coming in well for some time. We quote steel hoops at 1.45c. and bands at 1.40c., extras on the latter as per the present steel bar card.

Merchant Steel.—New orders entered by the mills and shipments in May were not satisfactory, showing a falling off as compared with the same period last month with no indications of an early betterment in demand. We quote the higher grades of merchant steels, f.o.b. Pittsburgh, as follows: Iron finished tire, ½ x 1½ in. and heavier, 1.40c., base; under these sizes, 1.55c.; planished tire, 1.60c.; channel tire, 1.80c., base; toe calk, 1.90c.; flat sleigh shoe, 1.55c.; concave or convex, 1.75c.; cutter shoes, tapered or bent, 2.25c.; spring steel, 2c.; machinery steel, smooth finish, 1.90c.

Rivets.—Several of the leading makers of rivets report that some heavy inquiries are in the market for structural rivets from fabricating concerns and also for boiler rivets from boiler makers and other consumers. These inquiries are taken to mean that a god deal of new business in both boiler and structural rivets is likely to be placed at any time. Regular prices on structural rivets are 1.90c. and boiler rivets 2c., but these prices are not being strictly observed, some makers continuing to quote structural rivets at 1.75c. to 1.80c. and boiler rivets 1.80c. to 1.85c., f.o.b., Pittsburgh. We are advised that only desirable orders are accepted at these prices.

Wire Products.—Several of these leading wire nail makers have notified the large trade that on all contracts for wire nails placed some time ago at $1.75 and under the price on all unshipped tonnage after June 1 will be $1.80. It is believed that this will stimulate specifications against contracts, which have been dull for some time, and will also have the effect of firming up prices. The tone of the market is already slightly stronger as a result of this action, and regular prices are being quoted on new business by all the mills. We quote galvanized barb wire at $2.10, painted, $1.80; annealed fence wire, $1.60; galvanized, $1.90; wire nails, $1.80, and cut nails, $1.60, f.o.b. Pittsburgh, full freight to destination added.

Spikes.—No large inquiries from railroads are in the market, the new demand being for small lots only. The best price of railroad spikes in standard sizes is $1.50, Pittsburgh, with usual extras for odd sizes.

Merchant Pipe.—Conditions in this trade are showing decided improvement, the demand being much better. Some large contracts for line pipe have been placed. Three or four of the leading pipe mills report that orders booked so far this month show an increase over the same period in April. The National Tube Company has taken an order for over 100 miles of 8-in. pipe for shipment to Mexico. The Caney River Gas Company has placed an order for 22 miles of 8-in. line pipe, plain ends; Logan Natural Gas & Fuel Company, 15 miles of 12-in.; Dominion Natural Gas Company, 10 miles of 6-in. and 10 miles of 4-in., and Medina Natural Gas & Fuel Company, St. Mary's, Ohio, 15 miles of 10-in. and 12 miles of 8-in. Regular discounts on iron and steel pipe, printed on a previous page, are said to be firmly held.

Boiler Tubes.—The new demand is dull and with not much prospect of early betterment. The tube trade was fairly good in the latter part of April and in the early part of May, but has fallen off considerably in the past two or three weeks. Regular discounts on tubes as revised recently and printed on a previous page are reported as being firmly held.

Coke.—The coke trade continues quiet. No large inquiries are in the market either for blast furnace or foundry coke. Most blast furnaces that buy their coke in the open market are covered for the remainder of the year, while the few that have not contracted are buying their coke from month to month. A Valley blast furnace is reported to have bought 5000 tons of standard grade coke for June shipment at about $1.55 per net ton at oven. The output in the Upper and Lower Connellsville regions has been steadily reduced for some weeks, the production for the last week having been about 275,000 net tons, much the lowest in any one week for a long time. We quote standard makes of furnace coke for June shipment at $1.50 to $1.55 per net ton at oven, and for delivery over the second half of the year at $1.75 to $1.85. We quote standard makes of 72-hour foundry coke at $1.75 to $1.90 for June shipment, and from $2.10 up to $2.40 to consumers, per net ton at oven, for delivery over the second half of the year. Some makes of both furnace and foundry coke have sold for prompt shipment at somewhat under the above prices.

Iron and Steel Scrap.—There has been decided improvement in the scrap trade in the past week, due largely to the purchase of 10,000 to 12,000 tons of heavy steel scrap for delivery to two important consuming points in this vicinity at $12.75 to $13, delivered, and it is said that even higher than $13 was paid for part. Consumers have been staying out of the market for some time and prices had gone to such a low figure, especially on steel scrap, that as soon as it was known that these heavy sales were made nearly all grades of scrap advanced from 25c. to 50c. per ton. Dealers are now quoting, per gross ton, Pittsburgh, about as follows:

Heavy steel scrap, Steubenville, Follansbee, Sharon Monessen and Pittsburgh delivery	$13.00 to $13.25
No. 1 foundry cast	13.50 to 13.75
No. 2 foundry cast	12.50 to 12.75
Bundled sheet scrap, at point of shipment	9.75 to 10.00
Rerolling rails, Newark and Cambridge, Ohio, and Cumberland, Md.	13.50 to 13.75
No. 1 railroad malleable stock	12.00
Grate bars	10.50 to 10.75
Low phosphorus melting stock	16.50 to 16.75
Iron car axles	24.25 to 24.50
Steel car axles	18.50 to 18.75
Locomotive axles	23.00
No. 1 busheling scrap	12.00 to 12.25
No. 2 busheling scrap	8.50 to 8.75
Old car wheels	13.50 to 13.75
Sheet bar crop ends	15.50 to 15.75
*Cast iron borings	9.00 to 9.15
*Machine shop turnings	9.15 to 9.25
Old iron rails	15.00 to 15.25
No. 1 wrought scrap	14.25 to 14.50
Heavy steel axle turnings	10.25
Stove plate	10.50 to 10.75

* These prices are f.o.b. cars at consumers' mill in the Pittsburgh district.

Chicago

FISHER BUILDING, CHICAGO, May 23, 1911.—*(By Telegraph.)*

Pig Iron.—There has been more activity in this market in the past seven days than in any week since the flurry of last February. The season for purchases of castings is here, and last half inquiries have appeared from many quarters for all kinds of iron. The total inquiries for Southern iron in this market will probably total about 7000 tons and inquiries for Northern will about equal that amount. It is felt that the improvement here is not due to recent important court decisions, but is rather that time has at last forced out some of the many cases where buyers have been holding back for price inducements. These demands were met with

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refusal on the part of furnaces for many weeks, but have been conceded recently. Southern spot and resale irons are commonly selling for $10.75, Birmingham, and the great bulk of Southern business now being placed is on the basis of that price for No. 2 foundry. Particularly attractive specifications are said to have brought quotations as low as $10.50, but these are not verified. Some producers are holding for $11, Birmingham, for the last half, but it is very generally conceded that $10.75 is the price upon which purchases are being made for that delivery. A Wisconsin manufacturer of gasoline engines is in the market for 1000 tons of No. 2 analysis, deliveries extending over the last half. A northern Illinois manufacturer of agricultural implements is inquiring for 1000 tons of No. 1 foundry. An inquiry for 1000 tons of malleable for Eastern shipment during the last quarter of this year and the first quarter of next is also reported. Among the numerous smaller inquiries in this district are 500 tons of high silicon, 300 tons of Southern foundry and 100 tons of high silicon. Two sales, 500 tons each, of Lake Superior charcoal have been made near Chicago. The following quotations are for Chicago delivery, with the exception of Northern irons, which are now quoted f.o.b. furnace:

Lake Superior charcoal	$17.00
Northern coke foundry, No. 1	15.50
Northern coke foundry, No. 2	15.00
Northern coke foundry, No. 3	14.75
Northern Scotch, No. 1	16.00
Southern coke, No. 1 foundry and No. 1 soft	15.60
Southern coke, No. 2 foundry and No. 2 soft	15.10
Southern coke, No. 3	14.85
Southern coke, No. 4	14.60
Southern gray forge	14.60
Southern mottled	14.60
Malleable Bessemer	15.00
Standard Bessemer	17.40
Basic	15.50
Jackson Co. and Kentucky silvery, 6%	17.90
Jackson Co. and Kentucky silvery, 8%	18.90
Jackson Co. and Kentucky silvery, 10%	19.90

(By Mail.)

Billets.—There are very few billet inquiries. The leading interest is maintaining $30.60, base, Chicago, on open-hearth forging billets, but this price is being decidedly cut by producers making less discard. In some instances it has been shaded fully $6. We continue to quote $25.60, base, Chicago, on rerolling billets.

Rails and Track Supplies.—Specifications against standing contracts have been better the past seven days than for some weeks, but new business has fallen off. The total of standard section sales is probably less than 3000 tons, no large percentage of which has emanated from the same source. Light rails continue to hold up well, and track supply business is satisfactory. We quote standard railroad spikes at 1.65c. to 1.75c., base; track bolts with square nuts, 2.15c. to 2.25c., base, all in carload lots, Chicago. Standard section Bessemer rails, 1.28c.; open hearth, 1.34c.; light rails, 40 to 45 lb., 1.16c. to 1.20½c.; 30 to 35 lb., 1.19½c. to 1.24c.; 16, 20 and 25 lb., 1.20½c. to 1.25c.; 12 lb., 1.25c. to 1.30½c., Chicago.

Structural Material.—Structural shapes are keeping up better than bars. The Mallers and the Rand-McNally buildings are reported to be a certainty for Chicago this year, and will probably require 4,000 tons and 3,000 tons respectively. Among the principal lettings of the week are the following: Mother House and Academy, Sisters of Notre Dame, Mankato, Minn., 307 tons; warehouse for Harshaw, Fuller & Goodwin Company, Elyria, Ohio, 116 tons; Chicago & Northwestern Railroad, bridges, 7,400 tons, let to American Bridge Company; Chicago & Northwestern Railroad, bridges, 650 tons, to Cambria Steel Company; Saticoy bridge, Ventura County, Cal., 300 tons; addition to post office, Salt Lake City, Utah, 225 tons, to Minneapolis Steel & Machinery Company; one 216-ft. and two 75-ft. spans over Spokane River, Spokane, Wash., 115 tons, to American Bridge Company. We quote plain material from mill at 1.58c. to 1.63c., Chicago; from store, 1.80c. to 1.90c., Chicago.

Sheets.—The sheet market is suffering from temporary quietness that has reduced the output to about 50 per cent. of mill capacity. Prices are not as firm as they have been for some weeks, and more or less cutting constantly taking place. Specifications against contracts are only moderate and new business is scarce. Chicago prices are as follows: Carload lots, from mill: No. 28 black sheets, 2.38c.; No. 28 galvanized, 3.38c.; No. 10 blue annealed, 1.83c. Prices from store, Chicago, are: No. 10, 2.10c. to 2.20c.; No. 12, 2.15c. to 2.25c.; No. 28 black, 2.75c. to 2.85c.; No. 28 galvanized, 3.65c. to 3.75c.

Plates.—Mills are running at about 60 per cent. capacity, with no business booked ahead. Every week closes upon mills that have cleaned up all standing orders. Car business is at a standstill, and there is not a single active railroad inquiry in the market. Principal producers are maintaining Chicago mill prices at 1.58c. to 1.63c.; store prices 1.80c. to 1.90c., Chicago.

Bars.—The bar market is very slow. New business is below normal and specifications are light for the season. Rumors of concessions on rerolled hard steel bars are now confirmed and we quote the reduction in this report. Some bar iron sales have been made as low as 1.20c., but they are made by mills whose rolling capacity is limited to certain sizes and cannot be taken as the market. We quote as follows, f.o.b. Chicago: Soft steel bars, 1.58c.; bar iron, 1.22c. to 1.25c.; hard steel bars rolled from old rails, 1.25c. to 1.30c. From store, soft steel bars, 1.80c. to 1.90c., Chicago.

Wire Products.—This branch of trade is holding up remarkably, and new business of greater volume than is usual at this season is reported. Barb wire is easily the most active item in the list, requests for prompt shipment accompanying practically every order. Prices are being well maintained as follows: Jobbers' carload prices, which are quoted to manufacturing buyers, are as follows: Plain wire No. 9 and coarser, base, 1.78c.; wire nails, 1.98c.; painted barb wire, 1.98c.; galvanized, 2.28c.; polished staples, 1.98c.; galvanized, 2.28c., all Chicago.

Cast Iron Pipe.—Routine inquiries for the week under review have been very good, and specifications against contracts are liberal. Kansas City, Kans., has purchased about 200 tons of water pipe. The leading interest was the low bidder on 3,000 tons of water pipe for the city of St. Louis, Mo., but the contract has not yet been awarded. Bids close May 23 on 1200 tons for La Crosse, Wis. Gas business is fair for the season, although business of such nature is largely pickup, as large requirements were bought earlier in the year. Railroad business is at a standstill, the only orders of this nature the past week having been for single carloads. Considerable business is pending, important among probable lettings being the requirements of the city of San Diego, Cal., which will probably total about 7500 tons. Prices are firm as follows, per net ton, Chicago: Water pipe, 4 in., $25.50; 6 to 12 in., $24.50; 16 in. and up, $24, with $1 extra for gas pipe.

Old Material.—There is little life to the scrap market in Chicago, and prices have been reduced on several items; in fact, the entire market is weak. The Chicago, Milwaukee & St. Paul list, approximating 1200 tons, closes today and the Burlington list, aggregating 3500 tons, closes May 25. Prices below are for delivery to buyers' works, all freight and transfer charges paid, per gross ton:

Old iron rails	$14.50 to $15.00
Old steel rails, rerolling	12.25 to 12.75
Old steel rails, less than 3 ft.	11.25 to 11.75
Relaying rails, standard sections, subject to inspection	21.00 to 22.00
Old car wheels	12.75 to 13.25
Heavy melting steel scrap	10.25 to 10.75
Frogs, switches and guards, cut apart	10.50 to 11.00
Shoveling steel	10.00 to 10.50
Steel axle turnings	8.50 to 9.00
The following quotations are per net ton:	
Iron angles and splice bars	$12.25 to $12.75
Iron arch bars and transoms	13.50 to 14.00
Steel angle bars	12.25 to 12.75
Iron car axles	18.00 to 18.50
Steel car axles	16.75 to 17.25
No. 1 railroad wrought	11.00 to 11.50
No. 2 railroad wrought	10.00 to 10.50
Steel knuckles and couplers	10.00 to 10.50
Locomotive tires, smooth	17.00 to 17.50
Machine shop turnings	6.25 to 6.75
Cast and mixed borings	5.25 to 5.75
No. 1 busheling	8.75 to 9.25
No. 2 busheling	6.75 to 7.25
No. 1 boilers, cut to sheets and rings	7.50 to 8.00
Boiler punchings	12.00 to 12.50
No. 1 cast scrap	10.75 to 11.25
Stove plate and light cast scrap	9.25 to 9.75
Railroad malleable	10.25 to 10.75
Agricultural malleable	9.25 to 9.75
Pipes and flues	8.00 to 8.50

Cincinnati

CINCINNATI, OHIO, May 24, 1911.—*(By Telegraph.)*

Pig Iron.—There is a slightly more favorable tone to the market, probably due to a few more inquiries coming out and to a little better movement of contract iron. The new carload business also shows some im-

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provement. While the majority of Southern producers are holding out for $11 at furnace for either prompt or deferred shipment there is a sufficient quantity of $10.50 No. 2 foundry for sale to make this latter figure the basis for a minimum quotation. Northern No. 2 foundry is quoted around $13.75 to $14. Ironton, both malleable and basic, are firm at $14, at furnace, and orders for all three irons covering shipment through the remainder of the year could doubtless be placed at this figure. Southern No. 2 foundry appears to be suffering more from the present weakness in prompt shipment prices than are the lower grades, and instead of the usual differential of 50c. a ton between the lower grades only 25c. is now observed. For July-August movement 200 tons of Southern special analysis iron was sold to a Northwestern melter at $11, Birmingham; for the same delivery and price a small lot of No. 2 foundry was taken by a nearby consumer. Two orders, totaling about 500 tons of Northern No. 2 foundry, were received from Illinois consumers at $14 for the last half, and at this price an Indiana firm took 200 tons of malleable. Inquiries include 200 tons of 8 per cent. silicon for an Indiana purchaser and 300 tons of Southern foundry for northern Indiana, both for the third quarter. There is also a miscellaneous lot of inquiries from nearby consumers for small tonnages of foundry iron. Based on freight rates of $3.25 from Birmingham and $1.20 from Ironton we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 foundry	$14.25 to $14.75
Southern coke, No. 2 foundry	13.75 to 14.25
Southern coke, No. 3 foundry	13.50 to 13.75
Southern coke, No. 4 foundry	13.25 to 13.50
Southern coke, No. 1 soft	14.25 to 14.75
Southern coke, No. 2 soft	13.75 to 14.25
Southern gray forge	13.00 to 13.25
Ohio silvery, 8 per cent. silicon	17.45 to 17.70
Lake Superior coke, No. 1	15.45
Lake Superior coke, No. 2	14.95
Lake Superior coke, No. 3	14.45
Basic, Northern	15.20 to 15.45
Standard Southern car wheel	25.75 to 26.25
Lake Superior car wheel	19.50

(By Mail.)

Coke.—There is some improvement both in the inquiry and number of orders booked for foundry coke. Quite a number of contracts expire July 1, and foundrymen are beginning to take some interest in the situation, although the majority of them are not operating on anything like full time. Foundry coke prices appear to be fixed around $2 for prompt shipment and at $2.10 to $2.40 for extended contracts. Furnace coke, especially in the Connellsville district, still shows signs of weakness and as low as $1.40 is quoted for prompt movement, and on a few brands that are considered standard $1.35 has been done. Contract quotations are between $1.65 to $1.90. All the above prices are per net ton oven in the Wise County, Pocahontas and Connellsville fields.

Finished Material.—Reinforcing bars for concrete work are in fairly good demand; hoops and bands also show some improvement, but beams and channels are just about holding their own. Boiler and tank plates have had a better week, and in comparison with previous nearby reports neither mill agencies nor dealers have any complaints to make. Soft steel bars are quoted at 1.40c. mill, Pittsburgh, and around 1.80c. warehouse, Cincinnati. The warehouse price of structural material averages about 1.90c.

Old Material.—The softening in pig iron prices, as well as the slack business in that line, appears to be reflected in the scrap market. There is very little demand for scrap material, and dealers are not disposed to take on additional stocks. Prices for delivery in buyers' yards, southern Ohio and Cincinnati, are as follows:

No. 1 railroad wrought, net ton	$11.50 to $12.00
Cast borings, net ton	4.50 to 5.00
Steel turnings, net ton	5.75 to 6.25
No. 1 cast scrap, net ton	9.75 to 10.00
Burnt scrap, net ton	7.00 to 7.50
Old iron axles, net ton	16.50 to 17.00
Bundled sheet scrap, gross ton	7.50 to 8.50
Old iron rails, gross ton	13.50 to 14.00
Relaying rails, 50 lb. and up, gross ton	21.00 to 22.00
Old car wheels, gross ton	11.00 to 12.00
Heavy melting steel scrap, gross ton	10.00 to 10.50

Philadelphia

PHILADELPHIA, PA., May 23, 1911.

The only movement in the pig iron market has been in Virginia foundry grades, and this has been the result of a cut of 75 cents a ton by the leading interest. Transactions in other foundry grades have been practically at a standstill, as eastern Pennsylvania producers have not met the reduction. Further quiet sales of basic iron are reported at $14.50, delivered. The finished material situation is practically unchanged; there has been a better run of business in heavy steel plates, but in the other lines the volume of business has been somewhat lighter. The demand for steel billets has been smaller. Bars are in light demand, with prices easier. The old material market is practically at a standstill.

Iron Ore.—Buyers continue to show hesitancy in considering purchases, owing to uncertainties confronting the iron trade, and no business of any importance is reported. Importations at this port in the week ended May 20 included 18,252 tons of Swedish, 6364 tons of Spanish and 4900 tons of Cuban ore.

Pig Iron.—Some excitement has been caused in the market by the announced policy of the Virginia Iron, Coal & Coke Company in reducing its price of Virginia foundry grades from the recent $13 level to $12.25, at furnace, for prompt and third quarter, and $12.50 for fourth quarter shipment. These reductions have induced a certain amount of buying in this as well as other districts. Sales here in the last few days aggregate from 2500 to 3000 tons, the largest reported being 500 tons, at prices ranging from $15.05 to $15.25, delivered here, for prompt and third quarter, and $15.30 to $15.50 for fourth quarter, according to routing of shipments. What effect this reduction will have on other Virginia producers is somewhat problematical. Some talk of blowing out their furnaces, but with one company the new low level has partially been met by its expressing a willingness to take care of its regular trade on a basis of $12.50, furnace, for delivery up to the end of the second quarter, but refusing to consider new business or enter orders for more extended delivery. The effect of the movement in Virginia iron has practically suspended business in eastern Pennsylvania foundry grades during the week. The principal producers in this territory have, so far, maintained $15.50 minimum for No. 2 X foundry, although at the present inside range lower grades can still compete with Virginia iron. Under pressure it might be possible to do $15.25, delivered, for some brands of No. 2 X not so firmly established, but at this time the market is not quotable at that price. Cast iron pipe makers have shown less interest in the market and no important transactions have been closed. The demand for forge iron has been practically at a standstill, and quotations are purely nominal. There have been no fresh sales of any consequence in steel-making grades. One transaction in basic, reported last week, at $14.50 for second and third quarter shipment, we now learn aggregated 10,000 tons, while reports are heard of another sale, understood to cover even a larger quantity, for the same delivery and at the same price, but definite information is being kept carefully covered. Consumers of basic would probably place orders for that grade for fourth quarter shipment, but producers still refuse to quote for deliveries so far ahead. Negotiations are pending for a fairly good sized lot of low phosphorus iron, but progress slowly, and sales in this grade have been small. The recent price concessions have made general buyers a trifle more cautious, and while moderate quantities of low priced iron have been taken, the general disposition appears to be to await further developments, particularly when it is possible to obtain iron for extended delivery at prices which are lower than recently prevailed for early shipment. The following range of prices is named for standard brands, delivered in buyers' yards in this district, for varying periods up to the end of the second quarter:

Eastern Pennsylvania No. 2 X foundry	$15.50 to $15.75
Eastern Pennsylvania No. 2 plain	15.00 to 15.25
Virginia foundry	15.05 to 15.50
Gray forge	14.75 to 15.00
Basic	14.50 to 15.00
Standard low phosphorus	21.00

Ferromanganese.—There is still an absence of inquiry from consumers in this territory, but a light demand from buyers in other districts is reported. Prices are nominally quoted at $36.50 to $37, Baltimore, depending on quantity and delivery.

Billets.—Orders have been somewhat smaller in the aggregate, and mills are less actively engaged. The principal maker in this district has been operating its mill on reduced time, having been idle for several days the past week. Prices, however, are fully maintained, consumers as a rule being willing to pay the market price for their moderate purchases. For early shipment open-hearth rolling billets are quoted at $25.40, and ordinary forging billets, $30.40, delivered in this vicinity.

Plates.—Eastern mills report a better run of miscel-

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laneous business, and some producers have been more actively engaged the past week, but orders being largely for early delivery do not insure continued activity unless the same rate of demand is maintained. There has been very little business in large quantities, although an inquiry for 2200 tons for steel pipe for western shipment is being figured on. A fair demand for locomotive and boiler steel is noted. Prices are being fully maintained, ordinary heavy plates being quoted at 1.55c. minimum, for delivery in this territory.

Structural Material.—No new propositions of importance have developed in this immediate vicinity. The contract for the tower building for the Maryland Casualty Company, Baltimore, about 1100 tons, has been awarded to Dietrich Brothers, of that city. Local building work has been confined to small jobs. The demand for plain shapes has not been large and mills show no gain in their productive rate. Fabricators are fairly busy with work in hand. Prices of plain shapes are unchanged at 1.55c. minimum, delivered here, while fabricated prices are still reported as being ragged.

Sheets.—Considerable irregularity prevails in the volume of business and size of individual orders. While mills continue fairly active they have, as a rule, little forward business on their books and can seldom figure on an operating rate for more than a few days ahead. Recent orders have been lighter. The following range of prices is named for prompt shipments, Eastern maker's mill: Nos. 18 to 20, 2.50c.; Nos. 22 to 24, 2.60c.; Nos. 25 and 26, 2.70c.; No. 27, 2.80c.; No. 28, 2.90c.

Bars.—The demand for defined iron bars continues to drag and, as mills are anxious for business, concessions have been made when the tonnage and specifications offered have been considered desirable. For such business 1.20c., Eastern mill, now represents the minimum, although for ordinary business 1.25c. is the usual price. For delivery in this territory 1.27c. to 1.35c. about represents the range of the market. Steel bars are not very active, but the price remains at 1.55c. minimum, delivered here.

Coke.—Little business has been done. The larger consumers do not appear anxious to contract, buying in small lots for prompt shipments, both in furnace and foundry grades. The only important inquiry is from the United States Government, which is inquiring for 3000 tons of foundry coke for use at the Boston, Brooklyn and League Island Navy Yards. Producers are not forcing business at current prices, although an occasional lot of cheap prompt coke comes out. The following range of quotations is named, per net ton, for delivery in buyers' yards, in this district:

Connellsville furnace coke	$3.70 to $4.05
Foundry coke	4.15 to 4.55
Mountain furnace coke	3.30 to 3.65
Foundry coke	3.75 to 4.15

Old Material.—Actual business has been light. Sellers of heavy melting steel have become a little firmer in their ideas as to prices, based on sales in other districts, but these, while a trifle higher, have not advanced to a point at which material would be diverted from this district. Small lots of No. 1 heavy melting steel are occasionally sold at $13, delivered, although any quantity would easily command $13.25, but sellers are not offering at that basis, preferring to hold what steel they have. The movement in special and rolling mill grades has been small and in many grades insufficient business to establish quotations has been done. The following range of prices about represents sellers' ideas of the market for deliveries in consumers' yards, eastern Pennsylvania and nearby points, carrying a freight rate from Philadelphia ranging from 35c. to $1.35 per gross ton:

No. 1 heavy melting steel scrap	$13.00 to $13.25
Old steel rails, rerolling	14.00 to 14.25*
Low phosphorus heavy melting steel scrap	16.75 to 17.25
Old steel axles	19.25 to 19.75*
Old iron axles	24.00 to 24.50*
Old iron rails	16.75 to 17.25
Old car wheels	13.00 to 13.50
No. 1 railroad wrought	15.00 to 15.50
Wrought iron pipe	12.50 to 12.75
No. 1 forge fire	10.50 to 11.00
No. 2 light iron	7.00 to 7.50*
Wrought turnings	8.25 to 8.75
Cast borings	7.75 to 8.25
Machinery cast	13.00 to 13.50
Railroad malleable	11.50 to 12.00
Grate bars, railroad	10.50 to 11.00
Stove plate	10.00 to 10.50

*Nominal.

Birmingham

BIRMINGHAM, ALA., May 22, 1911.

Pig Iron.—It develops that the buyers have to a certain extent won out in their fight to break down the $11 schedule on pig iron. About 9,000 tons is known to have been sold by one large interest the last few days on a basis of $10.50 for No. 2, though the price on lots under 500 tons appears to be held still very firmly at $11. Some of the larger buyers are now arguing just as insistently for a $10 price as they did before for $10.50, and still claim they will not buy at better than their own ideas of prices. It still appears to be a buyer's market, and undoubtedly, with the accumulation that appears on the yards of one or two interests, it would take a very heavy buying movement to establish the desired feeling of confidence in the situation. Some fair-sized sales of carwheel iron are reported at $22 to $22.50. Despite the feeling that prices may go lower, shipments continue at a fair rate, and it is felt that the showing for May will not be a bad one in the comparison of stocks on May 31 with April 30. Quotations seem well established this week on the following schedule for second and third quarter shipment:

No. 1 foundry and No. 1 soft	$11.00
No. 2 foundry and No. 2 soft	10.50
No. 3 foundry	10.00
No. 4 foundry	9.75
Gray forge	9.50
Mottled	9.25
Standard basic, chill cast	10.50
"Off basic"	10.00
Charcoal carwheel iron	22.50

Cast Iron Pipe.—The demand and general inquiry are reported good. Shipments are going forward day by day at a liberal rate on contracts. The requirements for San Diego, Cal., about 7,500 tons, are expected to be placed with local foundries the current week, and it is stated that no concessions in price are being made. Some good business for oil lines is up for consideration. All told the cast iron pipe makers seem to be better satisfied with conditions than has been the case for a year. Prices are quoted, per net ton, on board cars here, as follows: 4 to 6 in., $22.50; 8 to 12 in., $22; over 12 in., average, $21, with the usual differential of $1 more for gas pipe.

Old Material.—Dealers are slow to make any large commitments either way, and the market continues in the state of apathy which has characterized it for many weeks. It would take a most active pig iron market to put any life in the scrap market, and dealers are far from optimistic. Prices continue to rule about as follows, per gross ton, on board cars here:

Old iron axles (light)	$14.50 to $15.00
Old steel axles (light)	13.50 to 14.00
Old iron rails	13.00 to 13.50
No. 1 railroad wrought	12.00 to 12.50
No. 2 railroad wrought	10.50 to 11.00
No. 1 country wrought	8.00 to 8.50
No. 2 country wrought	7.50 to 8.00
No. 1 machinery	10.50 to 11.00
No. 1 steel	9.50 to 10.00
Tram car wheels	9.00 to 9.50
Standard car wheels	10.50 to 11.00
Light cast and stove plate	8.00 to 8.50

Cleveland

CLEVELAND, OHIO, May 23, 1911.

Iron Ore.—The market is extremely dull. A few small sales are reported, but no new inquiries for round lots are pending. Some of the ore operators are still hopeful of being able to close a contract with the Bethlehem Steel Company, which recently came out with an inquiry for a round tonnage of non-Bessemer ore for delivery over a period of five or ten years. Figuring on the Mesaba basis, the price offered is about 80 cents below the present market. While it appears improbable that high-grade ore can thus be secured, there is a possibility that the steel company may close a contract for an off-grade ore. Shipments continue light and there is practically no wild chartering of vessel tonnage. Independent vessel interests do not look for much improvement for several weeks. We quote prices as follows: Old range Bessemer, $4.50; Mesaba Bessemer, $4.25; Old range non-Bessemer, $3.70; Mesaba non-Bessemer, $3.50.

(By Telegraph.)

A local ore firm has just closed contracts for the sale of 400,000 tons of non-Bessemer ore. One sale was 300,000 tons for delivery at a Lake Michigan port over three years and another sale was 100,000 tons of low grade ore for delivery at Lake Erie ports this season.

Pig Iron.—Inquiries appear to be slightly better, but sales are mostly in very small lots. The foundry trade continues dull, and foundrymen see little incentive in placing last half iron contracts at present. Some in-

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definite inquiries have come out from consumers who say that they are feeling the market and that they have not yet decided when they will place contracts. A central Michigan foundry is in the market for 500 tons of No. 3 foundry for the last half. There is an inquiry from a New England consumer for 500 tons of malleable for the last half of 1911, and 500 tons for the first half of next year. We note one sale of 200 tons of malleable for early delivery to a Michigan plant at $13.75, southern Ohio furnace. There is a scattering inquiry for small lots of Ohio silvery iron for early delivery, and the usual quotation of $16.50 at furnace for 8 per cent is being shaded at least 25 cents a ton. Prices on Northern foundry iron are unchanged, but inquiry for a round lot might bring out lower quotations. Buyers are offering prices for Southern iron ranging from $10 to $10.50, Birmingham. For prompt shipment and the second quarter we quote, delivered, Cleveland, as follows:

Bessemer	$15.90
Basic	14.00
Northern foundry, No. 1	14.50
Northern foundry, No. 2	14.25
Gray forge	13.50
Southern foundry, No. 2	$15.10 to 15.35
Jackson Co. silvery, 8 per cent. silicon	17.75 to 18.00

Coke.—Some contracts are being taken for foundry grades for the last half and in a few cases for a year, buyers getting the same prices for an entire year as for the last half. There is no demand for furnace grades. We quote standard Connellsville furnace coke at $1.45 to $1.55 per net ton at oven, for spot shipment, and $1.75 to $1.80 for the last half. Connellsville 72-hr. foundry coke is held at $1.75 to $2 for prompt shipment, and $2 to $2.40 for the last half. Wise County coke is quoted at $2 for spot shipment and $2.25 for the last half.

Finished Iron and Steel.—The demand for structural material is holding up well, but only a limited amount of business is coming from manufacturing plants. The latter are following the policy of ordering often, but in very small lots. The largest new structural inquiry is for 1,000 tons for the new Eastern plant of the Peck, Stow & Wilcox Company, bids for which will be received in Cleveland this week. Bids were received May 22 for the Y. M. C. A. building in Cleveland, 1500 tons; some bidders submitted special proposals so that it will require a little time to figure out the lowest bid. John Gill & Son have been awarded the contract for the new plant of the Taylor & Boggis Foundry Company, Cleveland, about 350 tons, and will sublet the steel contract shortly. Some of the implement makers are feeling the market on steel bar prices, but mill agencies do not expect that contracts will be placed by this trade for some time. There are occasional reports that prices on steel bars are being shaded, but there appears to be no ground for these reports. The demand for steel girder rails for traction lines shows more activity than for a long time. There is also considerable inquiry from this source for spikes. The Lorain Steel Company has taken an order for 1000 tons of girder rails from the Cleveland Railway Company, and an order from the Columbus Railway & Light Company for 1100 tons, as well as several orders from Ohio traction lines for 200 to 300 tons. The demand for sheet continues rather light and the usual concessions are being made by the smaller independent mills. The inquiry from a western New York car company last week for 1150 tons of iron bars brought out prices as low as 1.20c., at mill. The usual quotation on small orders is 1.30c., at mill.

Old Material.—Inquiries for fair tonnages of heavy melting steel have come from the Pittsburgh district in the past few days, and local dealers have sold some steel scrap for Monessen, Pa., and Steubenville, Ohio, delivery, these sales being made at about $13, delivered, or $11.50, Cleveland. Sentimentally the market is slightly firmer, as a result of this activity in steel scrap. The local demand is limited to very small lots. Turnings have advanced slightly; otherwise prices remain about stationary. Not much scrap is being offered for sale in this market. Dealers' prices per gross ton, f.o.b. Cleveland, are as follows:

Old steel rails, rerolling	$13.00 to $13.50
Old iron rails	15.00 to 15.50
Steel car axles	17.50 to 18.00
Heavy melting steel	11.00 to 11.50
Old car wheels	11.50 to 12.00
Relaying rails, 50 lb. and over	22.50 to 23.50
Agricultural malleable	10.75 to 11.00
Railroad malleable	11.50 to 12.00
Light bundled sheet scrap	7.50 to 8.00

The following prices are per net ton, f.o.b. Cleveland:

Iron car axles	$21.00 to $21.50
Cast borings	6.00 to 6.25
Iron and steel turnings and drillings	6.50 to 6.75
Steel axle turnings	8.00 to 8.50
No. 1 busheling	9.50 to 10.00
No. 1 railroad wrought	11.50 to 12.00
No. 1 cast	11.25 to 11.50
Stove plate	10.25 to 10.50
Bundled tin scrap	11.00 to 11.50

The German Iron Market

BERLIN, May 12, 1911.

The iron trade situation continues to be involved in considerable uncertainty and doubt as to future developments. While little change has occurred within a fortnight, the tendency appears to have grown somewhat weaker in certain sections of the trade. Two tendencies are observable, according as any given concern operates on a large scale or belongs to the smaller class of producers. The former are still pretty well satisfied with the state of business, but the smaller establishments are in many cases complaining of insufficient work and low prices. Some sections report considerable price cutting, which may be taken as a sure indication that in general the situation has weakened. Some cutting in heavy plates is asserted to be going on, notwithstanding the fact that this specialty is covered by a price agreement. It is also stated positively by one western newspaper of prominence that price cutting on beams is very general, even 80 per cent. of the sales being at cut prices; but as beams are included in the class fully controlled by the Steelworks Union this report must refer to sales by dealers.

A Quieter Trade in Ores

The trade in ores has grown quieter, and prices have weakened somewhat for Spanish ores, but Swedish ores remain firm, Buying in foreign grades is light. Imports for April, however, remained very heavy. They reached 1,208,000 tons, as against 990,000 for April, 1910. The feeling in the trade is that Spanish ores are too high in proportion to the price of iron, and this is why furnacemen are rather hesitating about laying in stocks at existing rates. Russian manganese ores are also neglected and dull. Iron manufacturers are congratulating themselves that the new commercial treaty with Sweden contains a provision pledging Sweden not to collect an export duty on ores. This is a most important consideration for the German iron trade, which uses very large quantities of Swedish ores. The contracts for them extend for some years ahead.

Pig-Iron Market Unchanged

The pig-iron market remains practically unchanged. Iron on contract is being called for delivery at a satisfactory rate, but little new ordering is going on. There is still considerable foreign buying of foundry iron, but mainly in small lots. Some little supplementary buying for home delivery is reported, but most consumers have contracted for their requirements to the end of the year. The furnaces, according to agreement pending the existing negotiations for extending the syndicate, are taking no orders for 1912 delivery. The prospects for a general organization of the trade have materially improved. Several days ago a compromise was agreed upon with the Siegerland group of furnaces by which they are allowed an increase of 70,000 tons in their allotments over what the syndicate had first offered them. One important establishment of that district, the Geisweider Eisenwerke, will not enter, but as it consumes its entire make, except about 10,000 tons, in its own mills its independent position will not disturb the trade. It remains now to reach an agreement with the Lorraine-Luxemburg group, but the task of getting them to come in is expected to prove a considerably harder job than with the Siegerland people.

The production of pig in April was 1,285,400 tons, comparing with 1,322,000 in March, and 1,202,000 tons in April, 1910. For the first four months of the year production reached 5,107,300 tons, being a gain of 386,000 tons.

Waste and scrap iron shows a weaker tendency. More material is coming upon the market, and prices have given way within the past few weeks.

Structural Trade Is Active

Trade in semi-manufactured steel remains normal, and calls for delivery can be regarded as satisfactory,

THE IRON AND METAL MARKETS

after the remarkably heavy movement in March. Structural steel continues active under the brisk building operations at home, and foreign buying continues pretty good. In steel rails the volume of business has increased, partly owing to the larger orders of the Prussian railway authorities, and partly owing to good foreign business.

In the bar-iron trade there is a continuance of the confused and unsatisfactory conditions previously reported, and the fluctuating and uncertain price situation remains unchanged. Some of the mills, chiefly the great establishments, have orders as far as two months ahead, but not a few of the smaller works are in lack of orders; and they are doing most of the price cutting previously referred to. The reports do not agree as to heavy plates. Most of them state that orders have increased, but a few assert the opposite to be the case. Business in ship plates is very heavy; but it appears that not much new work is coming in. In the home trade prices are maintained, under the agreement, without difficulty; but in the export trade they are depressed by Belgian competition. Wire rods are quite active, especially for export. Home business in wire and in wire nails is very quiet. Piping is in active demand in the western part of the country, but from the Silesian district very unsatisfactory conditions are reported.

The spring trade in the hardware line was considerably more active than hitherto, but still it disappointed the high hopes of manufacturers. Many sections of the trade report overproduction, and nearly all complain of unsatisfactory prices. At Selingen a lighter home demand for cutlery is mentioned, but the export requirements are pretty heavy. A big demand for automobile and bicycle parts is mentioned as one of the most favorable points in the trade. There is considerable export business in locks and other builders' hardware.

April Exports Unsatisfactory

The April exports of steel were not of satisfactory volume. According to the trade returns the exports of blooms, billets, ingots, etc., amounted to 41,958 tons, against 57,122 tons in April, 1910; beams 28,390, against 45,925 tons; steel rails, 37,406 against 42,432 tons; and ties, 4,828 against 11,806 tons.

This week's news from the Belgian trade is again unsatisfactory. Prices are still falling, foundry iron and steel-making qualities are lower, and a cut of one franc on thin sheets for export is mentioned.

The German Niles Machine Tool Works, situated near Berlin, again failed last year to earn a dividend. After meeting all expenses and writing off a moderate amount, the company had net profits of less than 13,000 marks. It was established some ten years ago, but has never paid a dividend, and even lost a great part of its capital in the first five years of its existence.

Buffalo

BUFFALO, N. Y., May 23, 1911.

Pig Iron.—The fore part of the week gave indications of renewal of interest among consumers and inquiry for a considerable aggregate tonnage was received, including about 3000 tons of medium high silicon. Orders for about 3000 tons were also placed, mostly in small lots, but embracing one order for 1500 tons from a New Jersey buyer for No. 2X iron for last half delivery. The interest was not sustained during the week, however, and slackened to about the pace of the few weeks preceding, for scattering small lots. Specifications on contracts show a good volume. Prices are unchanged from last week, although a little better tone is observable and a somewhat more confident feeling on the part of furnace men that prices will soon improve. We quote as follows, for second and third quarter delivery, f.o.b. Buffalo:

No. 1 X foundry	$14.25 to $14.75
No. 2 X foundry	14.00 to 14.50
No. 2 plain	13.75 to 14.00
No. 2 foundry	13.50 to 13.75
Gray forge	13.25 to 13.50
Malleable	14.00 to 14.50
Basic	14.25 to 14.75
Charcoal	16.75 to 17.50

Finished Iron and Steel.—Plain and fabricated structural material are the lines showing the greatest activity. Steel bars and angles are quiet, although a fair aggregate of small orders is coming in. Plates are dull and inactive and the demand for shafting has fallen off noticeably. Specifications on contracts from agricultural implement makers tributary to this district and from Canada are well maintained. Business continues good in material for traction lines, and one or two new projects are reaching a stage which will result in orders for considerable tonnages during the summer. The leading interest reports a large order for steel products, aggregating 1500 tons, from the interior of the State; also the closing of contracts for considerable tonnages in railroad material and bar products for Canadian export. Prices of steel bars are being firmly maintained. The American Bridge Company has been awarded the contract for the 4000 tons of steel required for the 12-story hotel to be erected at Cleveland by E. M. Statler, of Buffalo. Bids for the Buffalo General Electric Company's 17-story office building, requiring about 2000 tons, will be closed May 24.

Old Material.—There has been no perceptible change in conditions in this market from the stagnation which has existed for the past several weeks. There is practically no buying by consumers, who apparently take no interest in the market, and the only tonnage moving is on very limited transactions between dealers. Prices are unchanged and nominal. We quote as follows, per gross ton, f.o.b. Buffalo:

Heavy melting steel	$11.50 to $12.00
Low phosphorus steel	14.00 to 14.50
No. 1 railroad wrought	13.25 to 13.50
No. 1 railroad and machinery cast scrap	12.75 to 13.25
Old steel axles	18.00 to 18.50
Old iron axles	22.00 to 22.50
Old car wheels	12.50 to 13.00
Railroad malleable	11.00 to 11.50
Boiler plate	9.50 to 10.00
Locomotive grate bars	10.00 to 10.25
Pipe	9.00 to 9.25
Wrought iron and soft steel turnings	6.25 to 6.75
Clean cast forgings	6.00 to 6.25

New York

NEW YORK, May 24, 1911.

Pig Iron.—The market has been rather more active in the past week, partly under the stimulus of the reduction of 75 cents on iron for early and third quarter delivery made by the largest Virginia producer. This company, it is understood, started out to sell 25,000 tons of its accumulated stock at $12.25 at furnace for No. 2 X foundry iron, delivery in the third quarter, and at $12.50 for fourth quarter delivery. Sales for this company are made through various firms, but most of the selling at the new prices has been by one interest. Something over 12,000 tons has been sold, chiefly in New England and eastern Pennsylvania. Not much has been done in the New York district. Other Virginia sellers have not met the low prices, although it is understood some would sell at $12.50 at furnace for early delivery. One sale of 1500 tons of No. 2 X iron has been made in New Jersey, the iron coming from Buffalo. Buffalo prices vary. It is understood that as low as $13.25 has been done out of Buffalo on early delivery iron, while $13.50 is asked for forward delivery. With $1.25 canal freight Buffalo iron now makes very sharp competition for Eastern producers selling in New York territory. Some business in malleable pig iron has been done in New England, the most of it by one Buffalo interest. There is rather more willingness to buy, but prices have been coming closer to buyers' ideas. Whether attributable to the reduction in Lake ores or not the whole pig iron market has been on a lower basis in the past two weeks. As has been the case for weeks little Alabama or Tennessee iron is coming into the East, and even at the recent concessions on Alabama iron Northern producers are holding this market. We quote on Northern iron at tidewater as follows: No. 1 foundry, $15.50 to $15.75; No. 2 X, $15 to $15.25; No. 2 plain, $14.75 to $15. For Southern No. 1 Foundry we quote $15 to $15.75; No. 2, $15 to $15.25.

Steel Rails.—The Carnegie Steel Company has sold 2000 tons to Z. W. Davis. The Buffalo, Rochester & Pittsburgh has bought 600 tons and the McClintic-Marshall Construction Company 500 tons. The Kansas City Southern's purchase of 14,000 tons is practically closed, being divided between the Maryland Steel Company and the Steel Corporation. A 10,000-ton lot is now under negotiation.

Finished Iron and Steel.—A better tone pervades the market, but it is doubtful if inquiries for material have come in any increased volume over what has been the prevailing rate of the last few weeks. The tonnage of structural materials is good, all things considered, with awards of promising size likely to be settled in the immediate future. The American Radiator Company is asking for bids on its projected plant at

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Bayonne, N. J., involving about 600 tons, and bids have lately been asked for the Aeolian building, New York 3300 tons; Riggs office building and theater, Washington, D. C., 2000 tons; highway bridge, McElhatan, Clinton County, Pa., 1000 tons, and extension of plant, International Harvester Company, Auburn, N. Y., 300 tons. A building for the east side of Broadway, at Liberty street, New York, is projected. Other new work includes 1500 tons of structural material for the Crowell, Sherman, Stalter Company for the New York Barge canal and 1000 tons for late delivery for piershed work at Thirty-third street, Brooklyn, N. Y. The general contractor for the 6000-ton Bamberger store building structure in Newark, N. J., the Geo. A. Fuller Company, has not placed the steel contract at this writing. Late structural contract awards are in part as follows: Maryland Casualty Company building, Baltimore, 1000 tons to Dietrich Brothers; McGibbon loft building, West Thirty-first street, New York, 900 tons, to Radley Steel Construction Company; viaducts at Scranton, Pa., 1600 tons, to York Bridge Company; building, American Smelting & Refining Company, Baltimore, 400 tons, to McClintic-Marshall Construction Company; asylum, Schuylkill Haven, Pottsville, Pa., 350 tons, to Eastern Steel Company; highway bridge, New Jersey, 500 tons, to Milliken Brothers; building (fire insurance company), Philadelphia, 900 tons, to Jones & Laughlin Steel Company. Some 12,000 tons of rolled steel and 1000 tons of pig iron for the emergency dams for the Panama Canal Commission will be furnished by an American company. Quotations are: Plain structural material, plates and steel bars, 1.56c. to 1.61c., and bar iron, 1.30c. to 1.40c., all New York. Plain material and plates from store, New York, 1.85c. to 1.95c.

Old Material.—The market is inactive. All business now being done is the result of solicitation, as there appears to be a complete absence of inquiry. Heavy melting steel scrap is the leader in transactions, but even in this material only small lots are changing hands, the largest sale reported in the week having been 200 tons. The limited character of current business is shown by the fact that frequent sales are reported of carload lots of steel scrap. The iron rolling mills are almost completely out of the market as buyers. The foundries are imitating the example of the steel works in becoming exceedingly critical as to the deliveries made on contracts, and rejections have lately been quite numerous in this line. Quotations under these circumstances are practically nominal, as follows per gross ton, New York and vicinity:

Old girder and T-rails for melting	$10.50 to $11.00
Heavy melting steel scrap	10.50 to 11.00
Relaying rails	20.00 to 21.00
Rerolling rails	12.00 to 12.25
Standard hammered iron car axles	22.00 to 22.50
Old steel car axles	17.25 to 17.75
No. 1 railroad wrought	13.00 to 13.50
Wrought iron track scrap	12.00 to 12.50
No. 1 yard wrought, long	11.50 to 12.00
No. 1 yard wrought, short	10.00 to 10.50
Light iron	4.50 to 5.00
Cast borings	5.50 to 6.00
Wrought turnings	6.00 to 6.50
Wrought pipe	10.50 to 11.00
Old car wheels	11.00 to 11.50
No. 1 heavy cast, broken up	11.00 to 11.50
Stove plate	8.50 to 9.00
Locomotive grate bars	8.50 to 9.00
Malleable cast	10.00 to 10.50

Cast Iron Pipe.—The successful bidder, May 19, on the contract placed by the New York Department of Water Supply, Gas & Electricity for laying pipe in the borough of Richmond, involving 6500 tons, was of course a contractor, who will buy the pipe. The same department opens bids to-day on pipe-laying contracts for the borough of the Bronx, involving 8900 tons of pipe, and for the borough of Queens, 1580 tons. No other important lettings are at present in sight in this section. More inquiry is reported from private buyers, indicating that considerable business is on the way. Carload lots of 6 in. continue to be quoted at $21 to $22 per net ton, tidewater.

Ferroalloys.—A slightly better demand for ferromanganese has developed, but there is considerable anxiety to sell and as low at $36.50, Baltimore, has been done. Buyers are inquiring for a few small lots of ferrosilicon and dealers are quoting on the basis of $52.50, Pittsburgh.

Reports that the Westinghouse Electric & Mfg. Company had placed contracts for the building of a new pattern shop at Trafford City, Pa., are incorrect. No contracts for new buildings or other equipment at Trafford City have been placed by this company, and probably will not be for some time.

Metal Market

NEW YORK, May 24, 1911.

The Week's Prices

Cents Per Pound for Early Delivery.

	Copper, New York.			Lead.		Spelter.	
May.	Lake.	Electrolytic.	Tin. New York.	New York.	St. Louis.	New York.	St. Louis.
18	12.25	12.00	43.20	4.40	4.25	5.50	5.20
19	12.25	12.00	43.60	4.40	4.25	5.50	5.20
20	12.37½	12.12½	.....	4.37½	4.22½	5.50	5.20
22	12.37½	12.12½	43.50	4.37½	4.22½	5.50	5.20
23	12.37½	12.12½	44.35	4.37½	4.22½	5.50	5.20
24	12.37½	12.12½	44.55 44.60	4.37½	4.22½	5.50	5.20

A sensational advance in the price of spot tin has taken place in London but this market has not followed the rise so closely, as supplies here for immediate use are plentiful. Copper is stronger than it was a week ago, selling at ⅛c. higher. Lead is weaker. Spelter is dull and neglected. Hungarian grades of antimony are freely offered at lower prices.

Copper.—The market is decidedly stronger than it was a week ago and some excellent sales have been made, especially for export. The United Metals Selling Company is offering electrolytic copper at 12.25c., delivered in the Naugatuck Valley, 30 days, which is equal to 12.12½c., New York. Some large selling interests are demanding more than that figure and others are meeting the price. Last Thursday and Friday there were good sales of copper at 12c. for electrolytic and 12.25c. for lake, and on Monday the price strengthened perceptibly. A great deal of the copper sold was for early delivery, and the action of the buyers clearly indicated that they are willing to take stocks at around 12c. but the demand fell off yesterday and to-day. The exports of copper have been very good so far this month, amounting in all to 21,046 tons with seven days to hear from. In London to-day spot copper was stronger than a week ago at £55 5s. and futures were selling at £55 16s. 3d.

Pig Tin.—The London market witnessed a sensational advance in pig tin prices during the week, the quotation on tin for immediate delivery going from £190 8s. 10d. last Wednesday to £204 this morning. There was an advance of £5 during the last two days. On the other hand, the price of futures has been practically stationary. Last Wednesday futures were quoted at £190 15s. and the same price was made this morning, the fluctuations during the week being very light. This means that the London syndicate has again cornered the market on spot stocks, but the available supplies here are so plentiful that the American market has not answered to the advance to a corresponding extent. A week ago spot tin was offered at 43c., New York, and this morning it could be had at 44.55c., which is considerably below the import parity. Consumers here are not taking much interest in the situation and there is hardly any trading between dealers. This market has now been below the London parity for more than six weeks, and as there are prospects of a squeeze in London in June it will not surprise those who are following the situation closely to see tin bought in this market very shortly for re-export. Consequently it would seem wise for consumers who are in need of stocks for early use to supply their wants before this takes place. Tin for delivery after the middle of June is plentiful enough in London at present at around £14 less than the price of spot tin, but if the syndicate operations continue successful the July supplies will shortly go up in value. The arrivals of tin so far this month have been very light, amounting in all to 2219 tons. It is judged that the month's arrivals will not exceed 2400 tons, as of 945 tons afloat only about 175 tons are expected to be at dock before the month is out.

Tin Plates.—Quotations on foreign tin plates have receded 1½d., the price this morning for plates at Swansea, Wales, being £13 6d. Good deliveries of domestic tin plates are being made, but new inquiries are not plentiful and there is considerable competition for the business in sight. Quotations, however, are firm at $3.94 for 100 coke plates.

Lead.—Lead is considerably weaker, and since last Monday it has been sold both in St. Louis and this market at 2½ points less than a week ago. The demand is very light and there are rumors to the effect that the leading interest is preparing to make a reduction in its quotation on desilverized lead. The price today in St. Louis was 4.22½c., and in New York it is being sold by outside interests at 4.37½c.

Spelter.—While spelter appears steady at 5.20c., St.

Louis, it is apparent that some important sellers are cutting that price, as dealers who have offered a slight concession have been losing the business. The price of spot spelter here is 5.50c., because of the scarcity of supplies in New York, but most buyers are placing their orders for stocks for immediate shipment from East St. Louis.

Antimony.—Interest is being taken in Hungarian antimony, good sized quantities of which are being offered in Europe at a price corresponding to 8c. Some holders of outside lots here are meeting that quotation, but both buyers and sellers seem to be awaiting developments. Cookson's is nominally 9.50c. and Hallett's 9c.

Old Metals.—Consumers are buying cautiously. Dealers' selling quotations are unchanged as follows:

	Cents.
Copper, heavy cut and crucible	11.75 to 12.00
Copper, heavy and wire	11.25 to 11.50
Copper, light and bottoms	10.50 to 10.75
Brass, heavy	7.75 to 8.00
Brass, light	6.50 to 6.75
Heavy machine composition	10.25 to 10.50
Composition turnings	8.50 to 8.75
Clean brass turnings	7.75 to 8.00
Lead, heavy	4.20 to 4.25
Lead, tea	3.95 to 4.00
Zinc scrap	4.25 to 4.30

Chicago

CHICAGO, May 23, 1911.

A fair tonnage of copper is being sold, but consumers are buying only for immediate consumption. Tin is somewhat stronger and is now quoted at 43.75c. No change is noted in lead. The prices quoted on antimony are largely nominal, and it is reported that considerable shading is being done on desirable specifications. We quote Chicago prices as follows: Casting copper, 12⅜c.; lake, 12½c., in carloads, for prompt shipment; small lots, ¼c. to ⅜c. higher; pig tin, carloads, 43.75c.; small lots, 46.50c.; lead, desilverized, 4.35c. to 4.40c. for 50-ton lots; corroding, 4.60c. to 4.65c., for 50-ton lots; in carloads, 2½c. per 100 lb. higher; spelter, 5.35c. to 5.40c.; Cookson's antimony, 10¼c., and other grades, 9c. to 10c., in small lots; sheet zinc is $7.25, f.o.b. La Salle, in carloads of 600-lb. casks. On old metals we quote for less than carload lots: Copper wire, crucible shapes, 12c.; copper bottoms, 10c.; copper clips, 11¾c.; red brass, 10¼c.; yellow brass, 9c.; lead pipe, 4⅜c.; zinc, 4¼c.; pewter, No. 1, 27c.; tin foil, 33c.; block tin pipe, 36c.

Iron and Industrial Stocks

NEW YORK, May 24, 1911.

The stock market has continued its upward course, on which it was started by the Supreme Court decision in the Standard Oil case. Some of the advances made in the past week were quite important. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Allis-Chalm., com...	7⅛- 8¼	Railway Spg., com..	33½- 35⅞
Allis-Chalm., pref...	29¼- 31	Railway Spg., pref..	100⅞-102¾
Beth. Steel, com....	32¾- 34	Republic, com.....	30⅞- 32¼
Beth. Steel, pref....	61 - 64	Republic, pref.....	95 -96⅞
Can, com.....	11¾- 12½	Sloss, com.....	52½
Can, pref.....	85¾- 88⅞	Pipe, com.....	17 - 18½
Car & Fdry., com...	54 - 57	Pipe, pref.....	56½- 58⅜
Car & Fdry., pref...	118 -120	U. S. Steel, com...	78¾- 81¼
Steel Foundries.....	43 - 44½	U. S. Steel, pref....	119¾-120⅜
Colorado Fuel.....	31½- 35	Westinghouse Elec..	72½- 75¼
General Electric...	159¾-161¾	Va. I., C. & C.....	61¾- 62
Gr. N. ore cert.....	62¼- 63½	Am. Ship, com.....	67 - 68½
Int. Harv., com.....	126 -128⅜	Am. Ship, pref.....	112½-113
Int. Harv., pref.....	126 -127	Chi. Pneu. Tool....	51⅜- 53⅜
Int. Pump, com.....	40 - 40¾	Cambria Steel.....	45⅜- 46½
Int. Pump, pref.....	88½- 88⅞	Lake Sup. Corp.....	28¾- 29¼
Locomotive, com....	38½- 43¼	Pa. Steel, pref.....	106¼-106½
Locomotive, pref....	106½-109	Warwick	10½
Nat. En. & St., com..	17 -17⅝	Crucible Steel, com.	13¼- 14⅛
Pittsburgh Steel, pref.....	105	Crucible Steel, pref.	81½- 82¾
Pressed Steel, com..	33½- 36⅛	Harb. Wk. Ref., com.	40¾- 41
Pressed Steel, pref..	100 -101¾	Harb. Wk. Ref., pref.....	96

Dividends

The Crucible Steel Company of America has declared the regularly quarterly dividend of 1¾ per cent on the preferred stock, payable June 30.

The United States Cast Iron Pipe & Foundry Company has declared the regular quarterly dividend of 1¾ per cent on the preferred stock, payable June 1.

The Pittsburgh Steel Company has declared the regular quarterly dividend of 1¾ per cent on the preferred stock, payable June 1.

The Harbison-Walker Refractories Company has declared the regular quarterly dividend of ½ of 1 per cent on the common stock, payable June 1.

The West Penn Steel Company, Brackenridge, Pa., in the Pittsburgh District, has declared an initial dividend of 1½ per cent on the common stock.

Personal

Several changes have just been made in the sales department of the National-Acme Mfg. Company, Cleveland, Ohio. W. S. Chase, who has been sales manager, has become general sales manager. A. W. Hopkins, formerly purchasing agent and office manager, has been appointed sales manager of the product department. E. C. Woolgar, formerly Western sales manager, has been appointed sales manager of the machinery department. R. J. Preston succeeds Mr. Woolgar as manager of the Western office and warehouse in Chicago.

Gordon C. Keith, managing editor of Canadian Machinery, the Power House and Canadian Foundryman, has resigned to join the editorial staff of the Canadian Manufacturer, Toronto. He is a graduate of Queen's University in mechanical and civil engineering and previous to making his connection with the technical publishing business had six pears' experience in manufacturing plans.

The J. Faessler Mfg. Company, Moberly, Mo., maker of Boss and Universal flue expanders, flue cutters and other boiler tools, has reorganized its sales department and placed Charles F. Palmer in charge, as sales manager, with office at 810 Olive St., St. St. Louis. He was formerly representative of the Frank E. Palmer Supply Company, St. Louis.

Charles W. Cade has recently resigned as foundry manager of the Blake & Knowles Steam Pump Works, East Cambridge, Mass., which position he has held for the last eight years. He is at present engaged in consulting work.

W. M. Chamberlin, for many years associated with Detroit firms as advertising manager, will conduct a general advertising agency for trade and technical service, with headquarters in that city. He has already secured several active accounts, including the Detroit Twist Drill Company, Wright Mfg. Company, Austin Separator Company and the American Supply and Machinery Manufacturers' Association. This last account combines advertising service to the members of the association, together with a campaign for securing new members.

William C. Redfield, vice-president of the American Blower Company, Detroit, Mich., who is Congressman from the Fifth District of New York, has returned home from the trip around the world, on which he started two or three months ago. The extra session of Congress necessitated his cutting short the trip while in India.

William Heindel, president of the Cincinnati Lathe & Tool Company, Cincinnati, Ohio, was operated on for appendicitis May 18, and is now recovering rapidly.

Harry A. Hunt has been appointed, and assumes the duties at once, as Eastern sales agent of the Edgar Allen American Manganese Steel Company, with offices at the company's plant, at New Castle, Del. He was for fifteen years connected with the Taylor Iron & Steel Company at High Bridge, N. J., where he was engaged in the engineering, operating and sales department. Mr. Hunt takes the place formerly held by Volney W. Mason, Jr., who has resigned and retired from the employ of the Edgar Allen American Manganese Steel Company.

Durand C. Alexander, Jr., who is a special agent for the Bureau of Manufactures, Department of Commerce and Labor, and who formerly represented the Nicholson File Company in the Far East, will sail for the Orient June 6 and will make reports to the government on the possibilities for selling American machinery there.

William Hill, of the machine tool building firm of Alfred Herbert, Ltd., Coventry, England, is spending several weeks in this country visiting American machine tool builders.

D. M. Weir, formerly secretary and manager of the Phillips Sheet & Tin Plate Company, operating mills at Weirton and Clarksburg, W. Va., has been elected vice-president and secretary of the company.

The American Foundrymen's Association

Sixteenth Annual Convention

PITTSBURGH, PA., May 23, 1911.—The sixteenth annual convention of the American Foundrymen's Association opened most auspiciously today in the Pittsburgh Exposition Building. Not at any previous meeting was such a wide range of machinery exhibited as at this, and a most gratifying feature of the exhibits this year is that practically all of them were installed and in operation when the doors were opened. A very large number of molding machines are shown, and as indicative of the development in this direction, there is an increased number and variety of jolt ramming machines on exhibition. One new type, which is attracting much attention, is electrically driven. Core making machines, of various kinds, are also plentiful. The registration of members and visitors since Monday has been very heavy, and the indications are for a record breaking attendance.

Major Joseph T. Spear, of the Pittsburgh Valve, Foundry & Construction Company, president of the American Foundrymen's Association, opened the convention promptly at ten o'clock. This was a joint session of the two sections, with the parent body, and there was a large attendance present. Major Spear introduced J. S. Seaman, president of the Pittsburgh Foundrymen's Association, who, on behalf of the local organization, welcomed the visitors most heartily to the Steel City.

H. M. Irons, assistant city solicitor, representing Mayor William A. Magee, and W. H. Stevenson, vice-president of the Pittsburgh Chamber of Commerce, followed Mr. Seamans with felicitations of welcome. These were responded to by Alfred E. Howell, Nashville, Tenn., one of the vice-presidents of the American Foundrymen's Association.

Major Spear followed with a brief address, in which he reviewed the progress of the foundry industry from the days when the rule of thumb methods prevailed to the present scientific methods of melting iron and making castings, for which advancement, he added, most credit was due to the work of the American Foundrymen's Association. He particularly complimented H. E. Field and Dr. Moldenke for the diligence and interest shown in the securing of papers for the present meeting. Reviewing briefly trade conditions, he said:

The conditions of the foundry industry to-day have been caused, in my opinion, by a combination of circumstances which I cannot recall ever having occurred before in my business experience. The prosperous business of 1906 and 1907, as we all remember, was followed by a panic which commenced in the autumn of 1907 and continued through the year 1908 and was succeeded by a fictitious boom early in 1909 which resulted in a large advance in wages and an increased producing capacity, but it soon developed that the country at large was not ready for the improvement, and after struggling along for almost two years we find ourselves to-day face to face with business conditions almost as bad as in October, 1907, except from a financial standpoint. In addition to this the changed political conditions of the country which indicate a complete revolution in regard to the tariff, the unrest of labor, the probability of a sufficient number of the State Legislatures fighting for an amendment to the Constitution of the United States authorizing Congress to levy an income tax, the time fast approaching for the Presidential election of 1912, together with other conditions which will finally arise, to my mind account largely for the position in which we find our business to-day.

Nathaniel K. B. Patch, president of the Brass Founders' section, in his annual report dwelt gratifyingly on the appointment of an official chemist. The organization will receive from this official each year a paper on any subject of interest to the association, designated by the executive committee, the research work and experiments to be conducted by him. This official is Arthur D. Little, Inc., Boston, Mass. The association will also receive annually from Mr. Little's firm a report reviewing the developments for the year in the non-ferrous metal industry, and he further agrees to furnish members with analyses of non-ferrous metals at a nominal charge.

The report of Secretary Corse showed a net gain in membership of 5½ per cent. since the Detroit convention. The present enrollment is 287. The report further called attention to the monthly Bulletin issued by the organization, which, in addition to publishing association news, also carried abstracts from the American Chemical Society Journal. No particular progress was reported in the work of the standardization committee, which had been delayed by the press of work at the Bureau of Standards; but tangible results were hoped for this coming year. There was cash on hand in the treasury of $94.88, after disbursements during the year of $1,386.59.

Dr. Moldenke followed with his report as secretary of the American Foundrymen's Association.

Report of the Secretary-Treasurer

Your secretary is happy to report that the affairs of the association are in a flourishing condition. The recent increase in the annual dues, while reducing the membership somewhat, has placed it upon a sound financial basis, so that there need be no hesitancy in expanding the work of the association, and thereby increasing its usefulness to the membership and the industry at large.

For the first time in the history of the association, its Transactions have been sent to the membership in bound form, in addition to the usual pamphlets, and a substantial volume of nearly 500 pages formed the record of the splendid Detroit convention of last June. So great was the demand for Dr. Porter's exhaustive report on the Chemistry of Cast Iron that the very few additional copies struck off, and only allowed to go out by special subscription to members, were quickly exhausted. The same can be said of a number of the other papers presented, all of which indicates a healthy desire on the part of foundrymen to keep informed.

The present slackness in our establishments has had the usual result of stimulating investigation along the lines of effective economy, and the mail of the secretary's office has reflected this most voluminously. The awakening of cities to the smoke problem has also seriously embarrassed many foundries, and it is respectfully suggested to our supply houses to get busy and devise ways and means to wash the gases emanating from the cupola, so that an ever-growing problem may be met.

TECHNICAL WORK OF THE YEAR.

The year has seen much progress along lines of continuous melting and the permanent mold, and perhaps the distinctive feature has been activity in utilizing waste metals in the foundry. Whether by briquetting or special methods of melting to avoid undue oxidation, the problem has been solved, and only proper introduction to the industry remains.

The special investigations carried on by the association have not been neglected. You will have before you a paper on the action of titanium on "malleable" presented by our member Mr. Gale, and Mr. Field will bring before us a short criticism of the molding sand tests so far carried out, his firm having been good enough to give us from its laboratory all the chemical data required.

Most of the physical tests on the 80 odd molding sands have been completed, and considering that this meant over 1500 separate tests the magnitude of the work can be imagined. In addition the Ohio State Geological Survey requested our association to add to this investigation the complete series of molding sands of that State, which meant a further 850 tests. It will still take some time to digest and complete this work, and then a report will be issued on the subject of molding sand. Your secretary looked after this work, aided by three assistants for the time being.

CONVENTION PAPERS.

The association is highly indebted to the Committee on Papers created at the Detroit convention. Particular thanks are due the chairman, H. E. Field, for his activity and success in getting valuable papers for this convention. Your secretary sincerely hopes that the committee will be continued. The indulgence of the convention is asked for the incompleteness of the printed matter distributed at this time. Whether the secretaries of other organizations have similar difficulty in getting the good writers of papers to complete their task in fair time is not known, but when it is stated here that on March 1 only one paper was in the hands of your secretary, and the outlook for more very gloomy, and this in spite of an early campaign, the fact that the programme has 43 separate items shows that interest comes late and all bunched together. The result is that the nerves of the secretary, the managers of two big printing houses, artists, engravers, etc., are in tatters, and only half of the papers in print and ready here, with more coming every day during the convention.

MEMBERSHIP AND FINANCES.

The instructions adopted at the Detroit convention have all been duly carried out. A new membership list has been

issued, and as funds are now available one will be brought out each year.

At the time of this report the membership of the association in good standing was 692. This will probably be reduced somewhat when the arrangement with the members of the former Supply Association ceases July 1. We have, however, every reason to congratulate ourselves upon the growing interest manifested in our work; for in spite of what may be said of the origin and development of the foundry revolution of recent years this has been the actual work of our individual members, and has had the hearty backing of the association as a body.

The financial statement for the year is as follows:

Receipts.

Balance	$ 268.53
Dues and subscriptions	5,085.50
Interest	40.18
	$5,394.21

Disbursements.

Transactions	$2,100.27
Printing	138.60
Convention expenses	233.85
Salaries	1,100.00
Postage	437.00
Sundries	43.79
	$4,053.51
Balance	$1,340.70
Special fund	201.25
Total	$1,541.95

At the morning session, S. G. Walker, Providence, R. I., read an elaborate paper on "The Control of Industrial Fire Insurance Cost," which was an outline of the principles underlying the cost of insurance as exemplified by the practice of the factory mutuals of Providence, R. I. He was followed by Elsworth M. Taylor, New York, with a paper on "Production Costs—a Factor in Scientific Management." A paper by S. E. Nold, Alliance, Ohio, "Why Cost Systems Fail," closed the morning session.

Before adjournment, Dr. Moldenke called the attention of the association to the recent deaths of W. W. Sly, president of the W. W. Sly Mfg. Company, Cleveland, and A. N. Spencer, vice-president of the Oliver Machinery Company, Grand Rapids, both of whom had made arrangements to attend the convention this year as usual. On motion of Henry M. Lane, Cleveland, seconded by A. W. White, London, Canada, the president was instructed to appoint a committee of three to draft resolutions of condolence and regard, copies to be sent to the bereaved families and to be spread upon the minutes of the organization. G. H. G.

New Tools and Appliances

This is essentially a news department for which information is invited

Improved Boring Machines.—A new horizontal boring machine possessing features which render it especially adapted for performing drilling, boring, reaming and facing operations on castings for aeroplanes or automobile engines has been recently built by the Binsse Machine Company, Newark, N. J. The saddle supporting the carriage is gibbed to the table from the sides, an arrangement which provides a stronger table and one less likely to vibrate when heavy cuts are being taken than when the other method of fastening the saddle by bolts and tongues in T-slots is employed. The outer bearing for the boring bar and the table support is so made that if desired it can be brought in close to the carriage, an arrangement which gives additional steadiness. All the working parts, the operating wheels and the levers of the head are conveniently located for the operator. The boring bar is 3 in. in diameter and has a 24-in. feed without resetting. The working surface of the table is 24 x 60 in. and the carriage has a reversible cross feed having a range of 36 in. The amount of floor space required by the machine is 5 x 12 ft. and the weight is 6500 lb.

A Heavy Gear Train for an Engine Lathe.—The Bradford Machine Tool Company, Cincinnati, Ohio, is equipping all of its engine lathes with a new type gear train in which the feed gears are entirely separate, thus making the feed independent of screw cutting. In this train the change gears can be used for feed purposes if desired.

A New Type of Twisted Drill.—A. C. Vauclain, 401 North Thirty-third street, Philadelphia, Pa., has recently placed on the market a new type of twisted drill. This differs from drills of the ordinary type in that the cutting edges of both lips meet at the center so that the abrading action of the point which is encountered in drills of the usual section and is one of the difficulties in the way of drilling large holes rapidly without an excessive expenditure of power has been eliminated. This peculiar construction of the point makes it possible to employ drills of any size without using a small drill for the pilot hole. Low power consumption is claimed as the result of a series of tests made with this drill, and the interior of the hole is smooth, instead of being rough, as is sometimes the case where a heavy feed has been used with drills of the twisted type.

Kerosene Torch.—The Hauck Mfg. Company, Brooklyn, N. Y., has recently placed on the market a line of kerosene torches for heating, light blazing, tinning, etc. The torch is made in a variety of sizes and is constructed so that the tank will remain cool while the burner is in operation.

Flaming Arc Lamps.—In addition to the 10 and the 17-hr. lamps which were illustrated in *The Iron Age*, March 31, 1910, the Stave Electrical Company, 27 West Twenty-seventh street, New York City, has brought out two new types of lamps, one burning 100 hr. without trimming and the other lasting from 150 to 200 hr. The general construction of these lamps is the same as the earlier type, and the carbons are fed by a motor. The heights of the two types are 32 and 37 in. respectively.

Acetylene Relief Valves.—Nelson Goodyear, 50 Church street, New York City, is making a valve for safeguarding acetylene apparatus by preventing the generation of excess pressure under any conditions. The device depends upon its operation upon a float which rises and falls with the water in the float chamber as the acetylene passes through. If for any reason the gas does not pass through the valve as rapidly as it has been generated, the water in the chamber falls and the float drops, closing the port leading to the generator and opening a vent.

A Turret Machine for Multiple Operation Work.—The Pottstown Machine Company, Pottstown, Pa., has developed a turret machine for handling a large variety of work that is ordinarily done with two or more chuckings. The construction of the entire machine is very rigid and the turret is hung between bearings which are placed a considerable distance from each other and is surrounded by the body of the machine, an arrangement which eliminates any tendency to spring or chatter. The turret is locked in position in the regular way, and while the tools are at work it is bound immovably in its seat by a cam and lever arrangement. When the turret is being indexed a spring releases the binding device. In designing the machine it has been made impossible for the operator to move the turret until the automatic gripping device is released, which takes place the moment the taps are clear of the work.

Large Tubular Calipers.—A line of tubular calipers with micrometer attachment has been placed on the market by the Davis Mfg. Company, Milwaukee, Wis. The sizes made range from the ordinary ones to a maximum of 78 in. in diameter.

Thrust Ball Bearing.—A new type of ball bearing known as the Nice thrust ball bearing is being made by the Pressed Steel Mfg. Company, Philadelphia, Pa. This bearing is being largely used for motors and engines, and is shaped in dies instead of being turned. The material employed in this construction is the same as that from which the all turned bearings are made, and after the bearings come from the dies they are hardened in the usual way.

Storage Battery Locomotive and Crane.—A new type of industrial locomotive has been brought out by the Atlas Car & Mfg. Company, Cleveland, Ohio. The capacity of the locomotive, which is equipped with a platform, is 8 tons, and that of the crane is 2 tons. The latter is mounted on a small truck at one end of the locomotive. Spring suspension is used for the motor, which is mounted at one end of the frame and connected to the driving axle through reduction gears. The various electrical instruments are mounted at one end, and the platform is removable to give access to the parts underneath.

The National Machine Tool Builders' Association

Ninth Semi-Annual Meeting at Atlantic City, N. J., Proves of Unusual Interest

The ninth semi-annual convention of the National Machine Tool Builders' Association, held at Atlantic City, N. J., Thursday and Friday, May 18 and 19, was a notable meeting, the papers and discussions being of exceptional value to those in the machine tool making industry. It was the eighteenth convention the organization has held. An indication of its success is contained in the remarks of Murray Shipley, Lodge & Shipley Machine Tool Company, Cincinnati, who at the end of the third session, in proposing a rising vote of thanks to the speakers, remarked: "This convention is the most successful the association has ever held, inasmuch as the papers presented and their discussion have brought us particularly close to the great problems in our business." There were about 150 members and visitors in attendance at the meeting, and remarkably few of them neglected any of the sessions. A large measure of the success of the meeting was due to the very efficient manner in which President F. A. Geier conducted the programme, with the able assistance of Secretary C. E. Hildreth.

The convention was organized on Thursday morning. After the usual convention committees were appointed a number of communications were read from members who were unable to attend. One of these brought forth some amusement as the reason given by the writer for not being present was "press of business." The members seemed to think that in view of the general business apathy the press of business excuse should be applauded, and it was. A communication from the Fairbanks Company, Springfield, Ohio, asking that the company be suspended from membership because of its being out of the machine tool making business temporarily, and suggesting that the organization have an associate membership, was referred to the resolutions committee.

President Geier, in his formal report, spoke optimistically as to the future of business. He said in part: "The business sky is clearer today than it was a few weeks ago and I feel that the recent decision affecting the Standard Oil Company should tend to clarify the atmosphere. In times like these, when we expect a growth of business, a careful analysis of shop conditions with a view that economies be effected should occupy our attention in order that we will be better prepared to meet an increased demand for our product and overcome the trying difficulties of manufacture. I cannot impress this upon you too much. Germany is so often mentioned that I hesitate to bring that country up once more, but the scientific thought of the Germans in the management of affairs is an example well worth our study. I hope that this convention will bring out an even higher state of efficiency in machine tool construction than exists today."

Secretary Hildreth, in his report, referred to the fact that an unusual number of new applications for membership were to be acted upon and spoke of the keen interest the members were taking in the association's affairs. The report of Treasurer A. E. Newton showed the organization to be on a good financial footing. There were no reports from the patent committee or the committee on the revision of the constitution. The committee on preparing list of machine tool users distributed reports that its work was not as yet completed. This committee has met with considerable co-operation, but some lists in the hands of machine tool builders prepared for their own use have not been available, for obvious reasons.

Non-Cancellation of Orders

C. Wood Walter, chairman of the cancellation of orders committee, presented a comprehensive report of the work done by the committeemen which indicated that their efforts in obtaining the co-operation of dealers toward doing away with the cancellation of orders has met with unusual success. Mr. Walter's report was as follows:

In making the final report of your committee on this subject, I offer a brief resume of its work: At the Rochester convention in May, 1910, several papers were presented suggesting various ways and means of abating the then too prevalent custom of cancellation of machine tool orders. As a result of this discussion the following resolution was passed at that meeting:

Resolved, That a thorough effort should be made by the Machine Tool Builders' Association, machine tool manufacturers and their agents, to eliminate the cancellation of machine tool orders, and to this end machine tool dealers should embody in their selling contracts, uniformly, the following clause, "This order is not subject to cancellation."

It is further resolved that the chair appoint a committee of three to confer with the proper committee of the Machine Tool Dealers' Association to co-operate with them in developing a concrete plan to bring about a general custom of trade which shall eliminate the cancellation of machine tool orders.

Upon the publication of the papers read at this meeting, a considerable discussion followed in the trade press, the leading papers editorially approving the efforts initiated by our association to bring about this reform, and making further suggestions as to how a better custom of trade might be established. Subsequent to this convention, your committee addressed all the leading machine tool manufacturers and dealers, suggesting the adoption of a "proposed non-cancellation clause" to be made a part of all proposals, quotations and contracts of sale. The replies brought in a consensus of opinion as to this method of procedure, which was placed before a joint meeting of our committee and a similar committee appointed by the National Supply and Machinery Dealers' Association. This meeting was held just prior to our New York convention in October, 1910. The following resolution was unanimously passed at the joint committee meeting referred to:

Resolved, That the following clause (to be made a part of quotations and order acceptances, as between the consumer and the machine tool dealer or the consumer and the manufacturer who sells direct) be reported to members of both associations for adoption, and uniform use immediately after adoption:

(CLAUSE)—"Note that all our proposals, quotations and acceptances of orders are made with the mutual understanding that orders are not subject to cancellation, provided shipment is made within the time specified."

This joint resolution was subsequently presented by your committee to our association at the October, 1910, convention. After a complete and full discussion on the floor, your committee offered a resolution which was adopted by unanimous vote, as follows:

Resolved, That we approve of the proposed non-cancellation clause agreed upon by the committee from this association acting jointly with the committee from the National Supply and Machinery Dealers' Association, and, further, that we agree to put same into use as soon as similar action is taken by the membership of the National Supply and Machinery Dealers' Association, which action we strongly urge the latter association to take at the earliest possible date.

This resolution was reported to the dealers' committee, and several weeks later the chairman of your committee was notified that the machine tool members of the National Supply and Machinery Dealers' Association by mail ballot had approved of the action of the joint committees and also our association, and had voted the adoption and uniform use of the "non-cancellation clause" as proposed.

Our secretary reports that the replies to postal cards mailed out to our membership last February indicated at that time that 84 members were making use of this clause. While some members failed to reply, yet it is apparent that a small percentage of our membership is at this time not making use of the clause. This may have occurred through the fact that many of our members do not sell or quote the consumer direct. However, notwithstanding this fact, it is urged that all members incorporate this clause in their literature and correspondence, placing same on their letterheads, so as to add moral effect to the dealers' effort to hold the buyer to the legitimate obligation he assumes when he places an order for machine tools.

On February 8 the secretary of the Dealers' Association wrote your chairman as follows: "We have followed this matter up largely through individual correspondence, and as a result of this have found but three members who have not placed the clause into effect." Under date of May 13, he advised again as follows: "I am very greatly pleased to be able to confirm my letter of February 8, and to advise you that the members of this association have adopted the 'non-cancellation clause' practically unanimously and are heartily in accord with the letter and spirit of the clause."

Representatives of other trades have been in correspondence with your chairman and are already adopting similar clauses, having heard of our action in this matter. It is very essential that manufacturers and dealers alike uniformly make use of this clause and persistently enforce its terms, if we are to bring about a better custom of trade and abolish the cancellation privilege with its attendant evils, so readily admitted by all. We want to make it disreputable as well as illegal to cancel an order except for failure on the part of the seller to fulfill the conditions of the sale. Remember, custom is stronger

than law, especially a "bad" custom. Unless we give notice in advance through the universal and uniform use of this clause, we cannot expect to correct or limit the custom of cancellation privilege.

Rufus King, chairman of the committee on incorporation, submitted a report, which was not read, giving the committee's reasons for recommending that the association be not incorporated. The report was filed with the committee on resolutions.

Arguments for Ship Subsidy Action

George J. Burns, who with P. G. March was delegated to attend the Merchant Marine Congress, made an eloquent address urging the members to lend their efforts toward establishing a merchant marine for the United States. Mr. Burns said in part:

One of the most important subjects before the manufacturers of this country is the matter of our transportation facilities to other countries. We are sitting in convention on the eve of one of the severest penalties ever inflicted on a business organization, but while we are inflicting penalties we are at the mercy of one of the grossest monopolies in existence, the restriction of transportation. Over 90 per cent. of our foreign commerce is in control of a foreign combine and it is at least doubtful whether our tribunals have any jurisdiction over it.

We are discriminated against in the most outrageous manner, and this trust possesses a fighting fleet prepared to drive out of existence any independent competition. This combine is either coercing our railroads or cooperating with them. For instance, the freight on a ton of steel from Pittsburgh to Japan is less than from Seattle to Japan, notwithstanding that both cargoes go on the same boat. The violations of this combine are so serious that the violations of the Standard Oil Company are in comparison beneficent philanthropy. One of its articles of agreement is that no member of that trust shall advertise in any newspaper that opposed the combination. Years ago we were transporting practically all of our own commerce on American-made and American-manned ships. To-day England has a merchant marine of over 7000 boats, Germany has more than 2000, Japan over 1000 while the United States has 14, ten on the Pacific and four on the Atlantic. The only solution is for our nation to rehabilitate our merchant marine by establishing some form of ship subsidy.

Mr. Burns' remarks were heartily applauded, and on the suggestion of one of the members his report was referred to the resolutions committee.

The Definition of Machine Tools

Fred L. Eberhardt, as chairman on the committee on the definition of machine tools, submitted the following report:

As a healthy mental exercise, and a pleasant change from chess and other similar amusements, try defining the above subject. It will prove instructive. One learns so much more about the subject he wishes to discuss if he will only stop just long enough to write it down clearly. After having satisfied himself as to its correctness, proceed to submit it to another, and to have him feel equally as satisfied with the result or conclusions first obtained will be found an entirely different problem.

Five years ago, at our New York meeting, one of our members proposed the name of a chuck manufacturer for membership in our association. Immediately diverse views were expressed as to his eligibility, in view of his line of manufacture, and quite a diversion of opinion prevailed over the subject. By referring to our constitution we found that all those engaged in the manufacture of machine tools were eligible. The question then arose—"What is a machine tool?" Various comments have since been received with more or less degree of amusement. It is a subject, however, which, if rightly treated, should prove of advantage and credit to our association.

Since our association has been seriously considering the term, writers from across the pond, as well as those from this side, have expressed their views in some of our leading mechanical papers. Your chairman, after a certain amount of work, received from our secretary a follow-up letter, urging the possibility of making a report on the subject for this meeting, and expressing some of his own views. His remarks were very opportune and decidedly refreshing, and he was immediately pressed into service, and admitted "at sight" into the innermost secrets, and as a result we have the coining of a new term, and are told that we have been following a false god, and that in place of "machine tools" we really have been making "tool machines." Our secretary has given us a very good view on the subject from this angle, in a paper written to the *American Machinist*, issue of May 11, page 895.

If you ask for the reason for the discussion of the subject, we would state:

1. The dignity of our profession deserves it as a guide to define our industry intelligently.

2. Our government can make use of it in the customs department, bureau of the census, and bureau of statistics, all of which will in time benefit our industry by reason of more completely kept records, etc.

Your committee has collected a quantity of information from leading individuals and concerns in this country, expressing their views, together with searching such works of reference as Lockwood's Dictionary of Mechanical and Engineering Terms, Century Dictionary, Webster's New International Dictionary, Standard Dictionary, Knight's Mechanical Dictionary, and Worcester's Dictionary as to the definition of a "tool," "machine," and "machine tool."

It is true of almost any question that one obtains a view depending largely upon the angle from which one approaches the subject. If we analyze the term from a grammatical standpoint, the question arises as to whether "tool" should be considered as a noun and "machine" as the adjective, or consider the words hyphenated, as some authorities treat it, as "machine-tool," and you have a compound noun. The mind can, without much apparent effort, find good reasons for both interpretations, and in the end it is a question whether or not the entire subject is not one which can be only solved by the rule of interpretation called habit or custom. A definition of the former, found in the Standard Dictionary, is: "A tendency or inclination toward an action or condition, which by repetition has become easy, spontaneous, or even unconscious." And of the latter: "An ordinary or usual manner of doing or acting, whether of a person or a body of persons."

Machine-tool by habit rightly is a compound noun, and grammatically should be hyphenated; but through habit again, apparently, the hyphen has been dropped, but the sense and inference have remained. You cannot make water run uphill, and we would not wish to undertake the impossible. Neither should we try the experiment of the "new spelling idea," the fate of which we all know, notwithstanding it had an able champion and advocate. But if some plan was sufficiently satisfactory for a body like our association to approve of and adopt it would, we believe, be recognized with authority, and be observed throughout the country.

As against the argument of the "tool machine" theory, we would cite the present-day practice of referring to tools, such as the hammer, chisel, etc., as "hand tools," and of the twist drill, reamer, tap, etc., as "small tools." (See Brown & Sharpe and Pratt & Whitney's latest catalogues.)

In view of the above reasoning, it would not be illogical to define a "machine-tool" as a "machine to actuate mechanically a tool and work piece relative to each other, to alter, shape or change the condition of said work piece;" or, "a machine adapted to actuate mechanically either the tool, the material to be operated upon by the tool, or both, in such relation to each other, as to alter the shape of the material or the condition of the same," the last phrase referring to such machines as the arbor press and electric welding machines.

The entire subject could be classified as machinery:

CHIP PRODUCING.

Metal Cutting Machines—
- Turning machines, vertical and horizontal.
- Drilling machines, vertical and horizontal.
- Planing machines, shapers, broachers, slotters.
- Milling machines, vertical and horizontal.
- Grinding machines, polishing.
- Shearing machines.
- Punching machines.

NON-CHIP PRODUCING.

Metal forming machines.
Spinning machines.
Wood-working machines.
Rolling machines.
Paper-working machines.
Pressing machines.
Thread and cloth-working machine.
Fibre-working machine.
Clay and stone-working machine.
Welding machines.

This line of analysis would be similar to the Government practice, for instance, in the Department of Commerce and Labor, under which the following distinct department heads will be found, each presided over by a separate chief:

Bureau of the Census.
Bureau of Immigration and Naturalization.
Bureau of Corporations.
Bureau of Labor.
Bureau of Manufactures.
Bureau of Statistics.
Bureau of Standards.
Bureau of Fisheries.
Bureau of Navigation.

The morning session closed with an address by A.

Hamilton Church, accountant, Boston, Mass., on "The Proper Distribution of Expense Burden." Thursday afternoon's session was given over to committee meetings. Not in a number of years have committees held such extended meetings. It is understood that the questions of machine tool classification and shop economies came in for a great deal of attention in the committee session.

The meeting of what was termed on the programme the "turning machine committee" was fraught with considerable interest. Many lathe manufacturers desire to have their product known as turning machines, and the appearance of that name on the programme supplanting the usual lathe committee announcement brought forth a great deal of discussion. It was significant that the programme committee and those in charge of making the committee room signs were at odds on the matter as "Lathe Committee" appeared over the door of the meeting room. During the discussion of committee matters some members referred repeatedly to turning machines, while others used lathe in frequent reiteration.

Machine Tool Arrangement in Shops

The session of Friday morning was an eventful one, as two papers on the department plan of machine tool arrangement—one on the basis of equipment and the other on the basis of product—were read and they aroused considerable comment. The first paper was read by F. C. Kent, superintendent Pierce-Great Arrow Company, Buffalo, N. Y., and the second by C. B. Auel, assistant manager of works, Westinghouse Electric & Mfg. Company, Pittsburgh, Pa. Both papers are reproduced elsewhere in this issue.

In the discussion which followed C. A. Johnson, Gisholt Machine Company, Madison, Wis., said that where the products of a factory are all alike it is probable that better results might be obtained by grouping the machines in one department. Where the same type of machines are grouped together the men see other operators develop new ideas and so increase their efficiency through cooperation. Where machines are used, however, for turning out diversified products Mr. Johnson held that the group arrangement might not work so well.

Fred L. Eberhardt, Gould & Eberhardt, Newark, N. J., said that in his mind the keynote of the papers read was the placing of the responsibility and the group plan might help in that direction. In the Gould & Eberhardt shops two types of machines are built—shapers and automatic gear cutters—and they are built in two separate departments.

William Hill, of the machine tool building firm of Alfred Herbert, Ltd., Coventry, England, who was a visitor at the meeting, said that his experience was that English shops which formerly were run at a loss had made money by organizing departmental groups. In a number of English shops test operations were made of the work after it left each group of machines, and he gave it as his opinion that test management went hand in hand with department management. In speaking of the use of grinding machines, he said that the group plan had been followed to such an extent that specialists in running grinding equipment had developed, and departmental management in other lines coupled with test management tended to bring out difficulties in workmanship and made it an easy matter to find out where work was costing more than it should.

Scientific Management

Following this discussion F. W. Taylor, general manager Tabor Mfg. Company, Philadelphia, Pa., spoke on the "Principle of Scientific Management," talking along lines that have been presented by him before other organizations and concluding with the statement that machine tool building is not a manufacturing proposition but largely an engineering problem. He outlined some of the work which had been done by himself and fellow-engineers in the scientific management of machine shops and displayed a number of slide rules designed to facilitate the solution of machine tool operation problems. He made the statement that in 30 years of scientific management of a number of establishments no strike had ever been declared, and he claimed that scientific management could be applied to machine shop work in a manner that would increase machine tool production to a surprising extent.

Durand C. Alexander, Jr., who will shortly make a trip to the Orient in the interests of American manufacturers as an attache of the Bureau of Manufactures of the Department of Commerce and Labor, was introduced by the president. Mr. Alexander said that the growth in the use of metal working machinery in the Orient, Australia and South Africa in the last few years has been sufficient to attract the attention of foreign manufacturers of metal working machinery. Present facts show that shipments of American machine tools to the entire Orient are not as large as those to one single European country, but, he added, the possibilities in the Orient are far greater than those of Europe. With the exception of Japan the duties are practically nominal and the market there will grow more rapidly than the European market. He asked for the machine tool builders' co-operation and stated that some of his special reports to the department will be of interest to machinery makers.

The session of Friday afternoon was given over to the consideration of employers' liability and workmen's compensation. Addresses were made by F. C. Schwedtman, of the Citizens' Industrial Association of St. Louis, and James A. Emery, counsel for the National Association of Manufacturers.

Resolutions Adopted

The association adopted the following resolutions:

WORKMEN'S COMPENSATION.

Resolved, That a committee be appointed to work in cooperation with similar committees of other organizations for improvement of present conditions on the lines pointed out by Messrs. Emery and Schwedtman:

1. Continuous and close relations with state and federal legislators, legislative committees or commissions engaged in the drafting of new liability or compensation bills.
2. Close cooperation with all organizations, national, state or local, who are interested in voluntary or compulsory compensation for injured workers.
3. Advice to members of our association on voluntary relief systems, liability or accident insurance, accident prevention and accident legislation.
4. A general educational campaign among the public, the newspapers, the colleges and among business and professional men in general, through the aid of addresses, illustrated talks, circulars and letters, all in the furtherance of our accepted principles for a sound compensation system.
5. A vigorous general campaign for early adoption of a statistical system on works accidents, so that at the earliest possible moment we may secure facts, instead of guess work to build upon.
6. A special campaign among state factory inspectors, to the end of securing higher ability and efficiency and less political influence.
7. The encouragement of mutual insurance and close cooperation with existing insurance concerns, with a view of securing rates for our members, in proportion to their individual accident prevention efforts.

And be it further Resolved, That the following cardinal principles and explanations shall be the basis of our association's future legislative endeavors:

1. All legislation must be for compensation (every kind of employers' liability legislation has proved a failure in every civilized nation).
2. Compensation legislation must cover every wage worker. (The man who, without his own fault, loses his hand in a farm machine is as much entitled to compensation as the engineer who looses his hand in an engine gear.)
3. Compensation must be assured. (It must be certain as the interest on United States bonds. This can be accomplished through insurance, approved and preferably guaranteed by the state or national government. However, every safe method of such approved insurance should be permitted. State, mutual and stock insurance, as well as relief systems covering individual shops, should be encouraged and none of them must be barred.)
4. Compensation must be efficient. (Not less than 75 cents, and preferably 90 cents, out of every dollar paid into the insurance fund should be paid to injured workers or their dependents. To this end legislation and solicitation expenses must be reduced to a minimum, and arbitration courts, or a simplified court procedure, are required for settlement of disputes.)
5. Employer and employees are jointly responsible for all unpreventable accidents and should therefore jointly meet the compensation expenditures (the employer covering approximately that part which is due to his fault and to the inherent hazard of the industry; the employee covering approximately that part which arises from his fault).
6. Every injury, except those due to criminal carelessness or drunkenness on the part of the worker, should be compensated.
7. Humanity and efficiency demand that prevention of accidents is made of prime importance. (Therefore, an efficient official inspection and statistical system which increases or decreases insurance rates in proportion to the accident prevention activities of each individual establishment is essential.
8. Since the progressive individual usually provides voluntarily for reasonable accident compensation, it is right that the reactionary or selfish individual be compelled to do likewise through universal compulsory insurance.
9. To prevent unfair competition between employers in different localities it is necessary that compensation laws of the various states are reasonably uniform.
10. Single liability is essential for reasons of efficiency and equity.

Resolved, That we favor the principle of state taxation and the creation of a state fund if adopted in connection with the legislation providing for the alternative lawful creation and administration of private funds, and upon no other condition.

MERCHANT MARINE AND PENNY POSTAGE.

Resolved, That it is the duty of the Senate and House of Representatives in Congress assembled to take such action as will assure the building up of a vigorous, independent steamship service of American-built and manned ships for the American merchant marine in time of peace and a powerful naval reserve in time of war.

Resolved, That the National Association of Machine Tool Builders, in convention assembled, favor a reduction in letter postage from two cents to one cent, with as little delay as possible.

The following firms were elected to membership in the association: Standard Mfg. Company, Bridgeport, Conn.; Cincinnati Gear Cutting Machine Company, Cincinnati, Ohio; Miami Valley Machine Tool Company, Dayton, Ohio; Stoever Foundry & Mfg. Company, Myerstown, Pa.; United States Electrical Tool Company, Cincinnati, Ohio; Burke Machinery Company, Conneaut, Ohio; Higley Machine Company, Croton Falls, N. Y.; Massillon Foundry & Machine Company, Massillon, Ohio; Stenle Turret Machine Company, Madison, Wis.; Cochran-Bly Company, Rochester, N. Y.; Brown & Sharpe Mfg. Company, Providence, R. I.; Meisselbach-Cattucci Mfg. Company, Newark, N. J.

The National Tube Company

Plant at McKeesport Inspected by Gas Men

The Natural Gas Association of America held its sixth annual convention in Pittsburgh, on May 16 to 18. On the afternoon of the last day a delegation of over 300, representative of the gas and oil trades, manufacturers, jobbers and consumers of pipe, casing and tubular goods in all forms, at the invitation of the National Tube Company, left the Exposition Building on a steamboat for a trip up the Monongahela River to the National Works of the company at McKeesport. This is the largest plant in the world devoted to the manufacture of pipe, tubes, casing, etc. The trip made it possible to see just what constitutes the "workshop of the world," for along the banks of the river are the large plants of the Jones & Laughlin Steel Company, American Steel & Wire Company, McClintic-Marshall Construction Company, Mesta Machine Company, Homestead and Clairton works of the Carnegie Steel Company, the Republic, Continental and Pennsylvania plants of the National Tube Company and many others. The visitors reached the objective point about 4 o'clock. George N. Riley had charge of the party, while on arriving the visitors were received by Edward Worcester, first vice-president; William A. Cornelius, manager of the National Works, and operating officials. A group picture was taken by the company's photographer on arrival, and the visitors then divided into small parties and were escorted through the different departments.

The first operation witnessed was the pushing of a standard gauge railroad car on a large electrically operated ore car unloader, which tilted the full car of ore into the large ore yards, where grab buckets in turn transported it to the blast furnace skips for charging. The tapping and pouring of the blast furnaces and the rolling of ingots were not inspected, as the officials considered it more interesting for the visitors to see the entire making of tubular goods from the plates up. Accordingly they were taken through the plate mill department, the continuous heating furnaces serving the continuous skelp mills, mostly electrically operated, and the butt and lap weld departments, where pipe was being made, cut, tested, threaded, etc. The manufacture of couplings was also witnessed, besides the coal handling machinery on the river, the boiler and engine rooms, pattern shops, foundry, machine shops, roll turning department, sanitary hospital and the new hydraulic pipe pulling machine for testing the strength of the body of pipe, threads and couplings. These operations proved of much interest and enabled the gas men to understand how the goods which they handle so extensively are made. Following is a brief description of the plant:

Description of the National Works

The National Works of the National Tube Company, situated on the Monongahela River, at McKeesport, Pa., has a length of a little over one mile, covering about 100 acres. It is protected along the entire river front by a concrete coped, steel pipe railed slag wall, being well above the ordinary flood line. It has its own McKeesport connecting railroad system, with direct connections with the Pennsylvania, the Baltimore & Ohio and the Pittsburgh & Lake Erie railroads, as well as facilities for shipping by river. The works is self-contained in its product, from the iron ore to the finished goods, embracing in its manufacture tublar goods, both butt and lap weld, from ⅛ in. to 30 in. in diameter, both black and galvanized, as well as a specialty in the way of Spellerized steel boiler tubes. In addition to the regular surface inspection and hydraulic test, in the case of boiler tubes, a special machine has recently been installed by which a test piece cut from each end of every tube is crushed and a flange is turned, all in one operation, insuring a very thorough and effective test, both for quality of material and workmanship, on every tube.

At the lower end of the plant are situated four large modern blast furnaces with their accessories of car dumper, ore bridge, etc., a steel plant and blooming and slabbing mills. The slabbing mill is one of the largest in the world and having the largest electric shear ever built. The furnace blowing engine room, in which is also located the central pumping station for the entire plant, is a most interesting aggregation of ponderous machinery.

The skelp mills are in the center of the plant, four in number, and all of the most approved type. The two mills for the narrower plates are of the continuous mill construction. The blooms go in at one end, and without any handling are delivered beyond the shear as skelp, cut to length, piled and ready to deliver to the trucks on their way to the tube and pipe mill end.

The tube and pipe mill building is approximately 1600 ft. long and 600 ft. wide, containing in all 23 acres, and being the largest building under one continuous roof in the world. In this building are twelve lap weld furnaces and six butt weld furnaces, two of the butt mill furnaces being of the double length type and able to produce pipe 40 ft. in length. This is true also of No. 1 lap weld, which is the only double length lap weld mill which has ever been operated; it will produce 40 ft. lap weld pipe from 3 to 12 in. and has been run on even larger sizes.

The shops of the works are all located at the upper end of the plant and are conveniently connected with the several mills by a telpherage system. The coal for the plant is lifted from the river by a coal hoist capable of lifting, crushing and screening 2000 tons of coal in 10 hr., this coal being distributed overhead in larries pulled by small electric locomotives. These and the telpherage system relieve a great deal of the handling of material on the surface tracks.

Every possible care is taken throughout the entire plant for the convenience and protection of the employees. All danger points are carefully railed off. All moving parts of machines are protected by gratings. Convenient lavatories and shower baths are provided. An emergency hospital is maintained where a doctor is in daily attendance, and a trained nurse is provided on each turn for dressings and emergencies.

The works employ from 6000 to 10,000 men, according to working conditions.

The Return

The party re-embarked at 5:45 o'clock. While refreshments were served the boat continued up the Monongahela River past Elizabeth, Pa. Coming down after dark, the trip greatly impressed the visitors, who observed the lighting effect of the open-hearth furnaces, rolling mills, etc., throwing out their flashes of fire. An orchestra on the boat made the time pass pleasantly, while the social intercourse made it possible to make many new acquaintances. On motion of David O. Holbrook, the chairman of the local executive committee of arrangements of the Natural Gas Association, a unanimous vote of thanks was extended to the officers of the National Tube Company for the manner in which it had cared for the visitors.

The Kerr Turbine Company, Wellsville, N. Y., has been reorganized and $125,000 new capital added. The stock interests of the company are now controlled by F. P. Merrill, Hornell, N. Y., and P. B. Hanks, Wellsville, who, as trustees, have directed its affairs for several years. Mr. Kerr is no longer with the company, his position as chief engineer now being filled by J. L. Moore, formerly a designer with the Westinghouse Electric & Mfg. Company and later in the engineering department of the Santa Fé Railroad. The plant will be materially enlarged, a new machine shop being already in course of erection. It is also the intention to incorporate into the Kerr turbine design changes which are based upon two years' experiments and which will improve the steam economy on all sizes by 15 to 20 per cent.

Hardness of Quenched Tool Steels

A Comparison of Carbon and Tungsten Steels

The *Revue de Metallurgie* for February contains an article by S. N. Brayshaw, giving the results obtained on quenching a series of tool steels, both of ordinary carbon steel and with a low percentage of tungsten. The anaylses of the steels worked on are given below:

Table 1.

No.	C.	Mn.	S.	P.	Si.	W.
W 1	1.18	0.42	0.023	0.014	0.18	0.47
W 2	1.16	0.37	0.023	0.014	0.10	0.48
W 3	1.19	0.28	0.012	0.011	0.23	0.57
W 4	1.15	0.31	0.012	0.011	0.21	0.50
A 1	1.16	0.37	0.018	0.014	0.07	..
A 2	1.14	0.40	0.018	0.014	0.09	..

The type of gas heated furnace used in the experiments is shown in the accompanying illustration. The interior vessel contains about 12 lb. of a fusible mixture of potassium and sodium chlorides with other salts, the names of which are not given. The bath is perfectly fluid at 680 deg. C. The two furnaces were equipped with electric resistance pyrometers. One was of such delicacy that ¼ deg. could be read, and the other was about one-third as sensitive. Very careful heating and cooling curves were made on a steel of the same composition as W 3. The arrest on heating was well marked at 738 deg. C. and on cooling at 7140 deg. C.; but if the temperature is raised above 880 deg. C., the arrest point is lowered, and in one case was found to be at 709 deg. C.

Hardness Tests

In Tables 2 and 3 are given the results obtained on samples of steel W 4, placed successively in two furnaces and quenched in salt water on leaving the second furnace:

Table 2—First Series.

No.	1st Furnace Temp.	1st Furnace Time in Fce. Min.	2nd Furnace Temp.	2nd Furnace Time in Fce. Min.	Brinell No.	Scleroscope No.
1 X	..	..	731° C	30	196	36
3 X	..	..	"	120	196	35
5 X	..	..	"	240	179	36
7 X	760° C.	10	"	30	600	103
9 X	"	"	"	120	477	88
29 X	"	"	"	240	241	53
12 X	802° C.	"	"	30	600	103
14 X	"	"	"	120	269	66
28 X	"	"	"	240	241	45
17 X	862° C.	"	"	30	600	99
19 X	"	"	"	120	340	70
21 X	"	"	"	240	302	54
23 X	893° C.	"	"	30	600	98
25 X	"	"	"	120	418	84
27 X	"	"	"	240	321	72

Table 3—Second Series.

No.	1st Furnace Temp.	1st Furnace Time in Fce. Min.	2nd Furnace Temp.	2nd Furnace Time in Fce. Min.	Brinell No.	Scleroscope No.
2 X	..	..	725° C	30	187	35
4 X	..	..	"	120	179	35
10 X	..	..	"	240	196	37
31 X	762° C.	10	"	10	269	64
6 X	"	"	"	30	163	33
30 X	"	"	"	60	159	32
8 X	"	"	"	120	163	31
11 X	802° C.	"	"	30	174	23
13 X	"	"	"	120	156	31
15 X	"	"	"	240	156	30
16 X	859° C.	"	"	30	217	45
18 X	"	"	"	120	170	32
20 X	"	"	"	240	166	32
22 X	890° C.	"	"	30	418	82
26 X	"	"	"	120	207	51
24 X	"	"	"	240	187	38

The author's conclusions are that the change on cooling takes place gradually at 731 deg. C., and more quickly at 725 deg. Moreover, it is notably retarded by a preliminary heating to 890 deg. If the steel is heated above the arrest point and then held a sufficiently long time at a certain temperature between the arrest on heating and that on cooling, and then quenched, the steel is softer than a sample heated to this same temperature and then quenched.

Temperature and Hardness

The author insists on the influence of a preliminary heating to about 880 deg. C., which brings about a change that is of great practical importance. Bend tests and tensile tests were carried out in connection with Sir Robert A. Hadfield and led to the following conclusions:

1. The necessary temperatures from which to quench carbon and tungsten steels are fixed, and complete hardness is attained in an interval of less than 6 deg. C. This temperature naturally coincides with the arrest of the curve on heating of the particular steel.

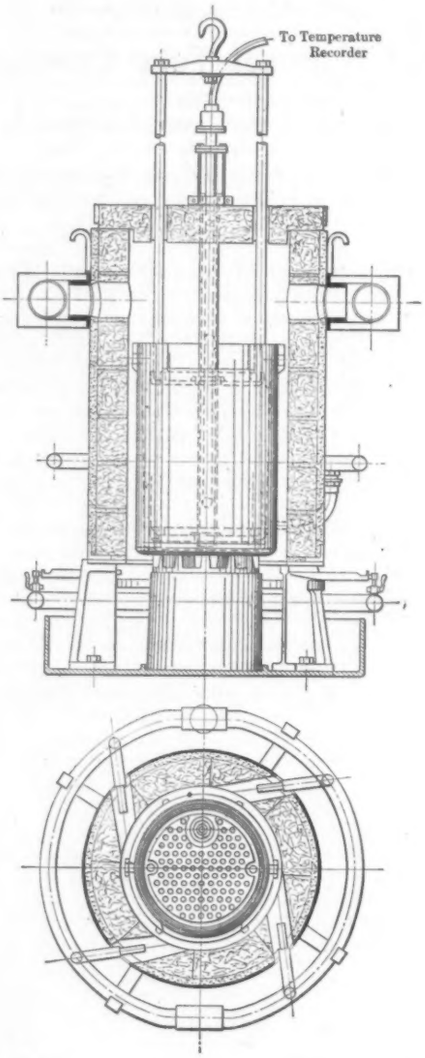
2. After the temperature has risen 20 or 30 deg. above the change point, the hardness diminishes as one increases the quenching temperature, provided the length of time of heating allows equilibrium to be attained.

3. There is a change toward 880 deg. C. for the tungsten steel and a little higher for the carbon steel. Bars quenched below this temperature show a contraction in length; above it an expansion.

Effect of Prolonged Heating

The influence of the length of time of heating is in general as follows:

1. If the heating is prolonged to two hours at the temperature where the change on heating is only half accomplished in one-half hour (732 deg. C.), the change is not completed.



Plan and Elevation of the Gas Heated Furnace Used in the Experiments.

2. At 760 deg. C. a prolonged heating is slightly harmful but does not greatly affect the hardness.

3. Toward 810 deg. C. the hardness of the quenched steel is great if the heating is only for a short time, but it diminishes after a half an hour's heating.

4. Prolonged heating at 880 deg. C. is very harmful. This is proved by the experiments given; but the author has found that a short heating, not over 7½ min., and then quenching, gives a particularly hard steel. Tables of tests are then given on quenching in salt water at temperatures rising from 5 to 51 deg. C. They show that the hardness of the steel diminishes as the temperature of the bath increases.

Effect of Preliminary Heating

Experiments were then made to study the effect of a preliminary heating and cooling in sand, before heating and quenching. The hardness of the tungsten steels quenched at 760 deg. C. is gradually lowered as the preliminary heating temperature rises from 700 deg. to 940 deg. C., but the hardness increases if the heating at 700 deg. is prolonged. The next series of experiments was

made with the two furnaces at different temperatures, heating the steel for a short and varying time in one, transferring to the other and then quenching. Very good results were obtained by a 2 min. heating in No. 1 furnace, at 880 deg. to 884 deg. C., followed by a 2 min. heating in No. 2 furnace at 720 deg. and then quenching. If the first furnace is hot enough it is easy to find the temperature at which to hold the second one, and the times of heating, so that the steel when quenched will have the same length as before treatment.

Careful tests showed that the tungsten steel heated for 15 min. toward 860 deg. C. and quenched in oil is harder than the carbon steel treated in the same way.

Limits of Quenching Temperature

The author's general conclusions are that the steel may be quenched over an interval of about 120 deg. of temperature and still show a good fracture. The lower limit of this interval is closely defined, but the upper limit is rather hard to determine. It can be said that quenching from a temperature up to 150 deg. above the arrest on heating does not appear to be harmful, judging by the fracture. This allows a safe margin for the ordinary workmen for ordinary tools, when judging by the fracture. The results obtained, however, conclusively show that this procedure will not give the best results, for small variations of temperature or of preliminary treatment seriously affect the final results.

It is true that most tool steels give good enough service if the quenching has been made in the interval of 120 to 150 deg., but there still remain many cases where it is important to obtain the best possible results. G. B. W.

The Calculation of Air Furnace Dimensions

Stahl und Eisen, Vol. 30, No. 36, contains two interesting articles on the above subject, one by Professor Osann, of Clausthal, and another by Engineer E. A. Schott. The latter is more elaborate and deals specially with muffle ovens for enameling iron ware.

The use of the air furnace for casting purposes dates back to the eighteenth century. (Cumberland, England, 1765). The cupola came later. The air furnace is particularly useful for melting large pieces, such as broken rolls, etc. Such furnaces run from 5 to 45 tons capacity. The best of bituminous coal with non-caking ash, to get a long flame, is essential. There are three styles of furnace in general use. The Staffordshire has the melting chamber contracted just as its joins the stack. The German furnace has the greatest depth of bath right under the stack, and tapping is done from that point. Finally is the American arrangement, with ample combustion space, and tapping from the side near the bridge wall, following the English method somewhat in this respect. Unquestionably the American style is best, as it allows the removal of the entire end of the furnace for charging purposes.

Apart from the proper dimensions of the hearth for a given required tonnage, the distance between the roof and the surface of the bath of metal is one of the most important points to be considered. This is also the case in the open hearth furnace. In the actual operation of the air furnace, the first effect is the simple transfer of the heat of the flame into the cold charge. Iron being a good conductor, this goes on for some time, the furnace remaining cold. Gradually, however, the walls of the furnace acquire heat also, and as the conductivity of the fire brick is six times as great at 1600 deg. C. as it is at 100 deg. C., even though brick is a poorer conductor than iron, there is a large quantity of heat stored up in the walls of the furnace, which, being hotter than the iron, radiates heat out into it. As soon as this takes place there is a rapid heating up of the metal charge and the iron melts. Hence also the name "reverberatory" furnace. In the course of time during the melt the brick work will take up only just as much heat as it gives off, and then the furnace works slow, the quantity in question being that which the brick may take up in consequence of its degree of conductivity. If, therefore, the hot gases are made to pass only just as fast as the brickwork can take up the heat, the maximum of economy will have been effected.

To get at this point, it will be well to consider the number of seconds a given quantity of gas will remain in the furnace. For instance, if the melting chamber contains, say, 105 cu. ft., and 35 cu. ft. of gases are available per second, then these gases remain in the furnace three seconds. Without calculating these volumes at the high temperatures existing in the furnace during operations, but taking the figures at freezing point, the following table has been constructed by Mr. Schott in comparing the several furnaces enumerated below:

Furnace No.	1	2	3	4	5	6
Tonnage	6	5	3	10	10	5
Per cent. coal used	40	32	40	45	30	40
Time, lighting up to tap, hr.	12	10	8	20	9	12
Coal per hour, lb.	1,027	880	825	1,236	1,393	880
Cu. ft. per sec. of gases (allowing 100% for air excess.)	77.7	66.4	62.5	96.0	136.6	66.4
Combustion space above bath, cu. ft.	132.0	172.6	137.0	252.4	528.0	164.5
Gases remain in furnace, sec.	1.70	2.72	2.30	2.96	3.60	2.50

Nos. 1, 2, 3, 4 and 6 are German air furnaces and No. 5 is American. In a foot note, the editor of *Stahl und Eisen* takes exception to the 100 per cent. excess of air allowed for combustion, as is the case with boiler practice. It would be impossible to get the exceedingly high temperatures required in the air furnace were such an amount allowed to enter. A 30 per cent. air excess would be more nearly correct.

The calculation of the hearth is as follows: The surface should be 5 to 10 sq. ft. for every ton of metal charged, making it 5 sq. ft. for the largest sizes (15 to 45 tons) and 10 sq. ft. for the smallest furnaces (below 7½ tons). The width of the furnace should range between 4 and 7½ ft., according to the tonnage. The length of hearth can be figured out from the above. An unobstructed passage of the gases through the furnace up to the stack flue is desirable, as there are many unburned gases passing over the bridge wall which will be utilized in the combustion space if ample enough. R. M.

British Pig Iron Production in 1910

The statistics of the British Iron Trade Association show that the production of pig iron in the United Kingdom in 1910 was 10,216,745 gross tons, as against 9,664,287 tons in 1909, 9,289,840 tons in 1908, 9,923,856 tons in 1907, and 10,149,388 tons in 1906. The output for 1910 makes a new record in British pig iron production for a calendar year, though for the 12 months ending June 30, 1907, the total was 10,438,976 tons. The output of basic iron in 1910 was 426,000 tons more than in 1909, while that of hematite iron was 330,000 tons larger. The falling off in forge and foundry iron from 1909 was about 225,000 tons, of which 181,000 tons was foundry iron. The average number of blast furnaces in operation in the year was 335¼, against 319¾ in 1909, 316¼ in 1908 and 366¼ in 1907. The total number of blast furnaces in the United Kingdom on December 31, 1910, was 506. The average production per furnace last year was 30,475 tons.

Paxson Foundry Supplies

The J. W. Paxson Company, Philadelphia, Pa., is completing a new factory building, covering an area of 9000 sq. ft., built of steel and concrete, with a saw-tooth roof, providing excellent lighting facilities. Modern machinery will be installed for manufacturing foundry riddles of steel, brass and galvanized wire. The wire cloth will be specially woven for riddle sifter and window guard purposes. Wire, bristle and bamboo brushes and brooms, for foundry, machine and general cleaning purposes, will also be manufactured. When the plant is completed Farley boiler tube and flue cleaning brushes, foundry bellows and other foundry supplies will be given greater attention than heretofore. The new building is entirely separated from the machine and plate shop, pattern shop and blacksmith shop, in which the Paxson company manufactures its cupolas, ladles, sawblast outfits, tumbling barrels, patterns and pattern making supplies, etc.

The Sharpsville Advertiser, Sharpsville, Pa., has published, in its issue of May 17, the record of the work done by the Sharpsville furnace in 1859, when John J. Spearman assumed charge of it. The account is in great detail and is stated to have been reproduced from a record made in Mr. Spearman's own handwriting at that time. He is now in his 87th year, in vigorous health, and is president of the First National Bank of Sharon.

The National Association of Manufacturers

The proceedings of the first two days of the sixteenth annual convention of the National Association of Manufacturers, held last week at the Waldorf-Astoria, New York, were reported in *The Iron Age* of May 18. The final day, Wednesday, was devoted to a number of matters, including the election of officers.

A. H. Baldwin, chief of the Bureau of Manufactures, Department of Commerce and Labor, made an address in which he urged manufacturers to use the facilities of the bureau in getting information, especially with regard to foreign trade, just as the American farmer looks to the Department of Agriculture. It is only in this way that the bureau can learn how to make its work more efficient and valuable. Ex-Chief Edward F. Croker, of the New York Fire Department, made an able address on the promotion of means for fire prevention.

An address by Prof. Arthur A. Hammerschlag, director of the Carnegie Technical Schools, Pittsburgh, Pa., on "Industrial Education" concluded with the statement that individual employers have tried to dwell on the calamity which has overtaken the country in the loss of the old time apprenticeship system, forgetting that our industrial processes make such a system no longer an all round training: nor can we ever receive it on its same economic and social basis which was the ideal of the ancient guilds of Europe. Expert teaching and true education, tied to the living aspirations of our young men, are destined to produce successors to the old-fashioned mechanics, far better equipped with intelligence to meet the pressure of future demand. The following resolution was adopted:

Resolved, That we favor the establishment in every community of the continuation school, wherein the children of 14 to 18 years of age now employed in the industries and art shall be instructed in the sciences of their respective industry and citizenship.

A resolution was adopted in favor of an international court of arbitral justice for settling disputes among nations. Another resolution adopted was the following:

Resolved, That the association recommends to Congress the passage of a bill like that under consideration in the last Congress, and advocated by President Taft, providing for sufficient postal compensation to establish a swift and regular service in American steamships to the principal countries of South America, and to the ports of Australasia, Japan, China and the Philippines.

The election of officers resulted in the retention of John Kirby, Jr., Dayton Mfg. Company, Dayton, Ohio, as president and of F. H. Stillman, Watson-Stillman Company, New York, as treasurer. The directors are F. H. Stillman and Ludwig Nissen, New York; J. G. Battelle, Columbus, Ohio; C. S. Brantingham, Rockford, Ill.; H. S. Chamberlain, Chattanooga, Tenn.; G. T. Coppins, Boston; John Trix, Detroit; C. C. Hanch, Indianapolis; C. M. Jarvis, New Britain, Conn.; C. L. Langworthy, Philadelphia; H. E. Miles, Racine, Wis.; Daniel Simonds, Fitchburg, Mass.; David M. Parry, Indianapolis; Enos Paulin, Bridgeton, N. J.; C. W. Post, Battle Creek, Mich.; R. S. Hamilton, Providence, R. I.; F. C. Schwedtman, St. Louis; George D. Selby, Portsmouth, Ohio; Giles H. Stillwell, Syracuse, N. Y., and D. A. Tompkins, Charlotte, N. C. George S. Boudinot was reappointed secretary.

The Banquet.

The annual banquet, on Wednesday evening, was participated in by several hundred persons. Ludwig Nissen presided with ability as toastmaster. Addresses were made by Gen. Harrison Gray Otis of Los Angeles, President Kirby, Preident Howard Elliott of the Northern Pacific Railroad, Congressman Nye of Minnesota and Judge W. H. Speer of New Jersey. General Otis received an ovation, in recognition of his great fight for industrial freedom. Mrs. Harriett Fisher, manufacturer of anvils, Trenton, N. J., the only woman member of the association, was so enthusiastically called on for a speech that she was obliged to make a few remarks, which were vociferously applauded.

President Elliott's address was a scholarly and convincing presentation of the demand of the railroads for fair play. Among other things he said:

The welfare of the people of this country, of the manufacturers and of all business including the railroad business are interdependent, and in the long run there must be proper relations between them and the government and fair and reasonable treatment of and by each, to permit that progress in this country which its marvelous resources and intelligent population justify.

In times of big demand the manufacturers can and do increase their unit prices and in poor times they are at liberty to decrease them in order to encourage trade. They can meet competition and take on extra business without cutting the entire scale of prices. In the railroad business, however, an excessive demand not only brings no increase in the unit price, but legislatures and commissions, which have practically taken charge of the management of the railroads, more and more take the view that an increasing demand justifies lower prices, thus reversing the old-fashioned law of supply and demand.

The so-called railroad question has been magnified and much distorted by politicians and doctrinaires. But the railroad business has achieved moderate success not because of legislative interference but in spite of it. The railroad owner by courage and intelligence in adopting advanced methods has been able to improve the railroad sys- the railroad user had paid in 1910 the same average freight the railroad user had paid in 1910 the same average freight rate as in 1870, he would have paid $3,092,662,300 more than he did pay; if he had paid the same average rate per passenger mile in 1910 as in 1883, the additional payment would have been $164,353,800, the two amounts being greater than the entire earnings of all the United States railroads in the last year.

Bailey Sheet Furnace Equipment

The Canton Sheet Steel Company, Canton, Ohio, started production in its new plant about five months ago. During the short time the plant has been operating it has broken all records for output, averaging 102 tons of No. 28 gauge a week per mill, with a conversion cost also claimed to be the lowest on record. This is stated to be largely due to the furnace equipment and the employment of mechanical stokers. The furnaces, which were designed and installed by George J. Hagan, furnace engineer, Pittsburgh, are of the single type. All are fired with American underfeed stokers, delivering uniformly heated material and clean bars with no scale. The fuel consumption of the single or independent furnace averages 450 lb. of slack coal per ton of finished product. The furnace fires are cleaned once every eight hours, and it is worthy of special notice that a remarkably small amount of ash is removed at each cleaning—about one wheelbarrow load. The sheet furnaces are equipped with two stokers each. The power required for the equipment of stokers for the entire plant is only 7 hp.

Orders have recently been placed with Mr. Hagan by the Portsmouth Steel Company, Portsmouth, Ohio, for an equipment of his combination furnaces.

First Ore from the Cuyuna Range.—The first trainload of ore from the first shipping mine on the new Cuyuna range of Minnesota was made recently by the Rogers-Brown Ore Company, owner of the Kennedy mine. The train as it left the mine was appropriately decorated and a banner indicated that its load was the first Cuyuna range shipment. The Rogers-Brown Ore Company has done a vast amount of work at the Kennedy property in the past three years and already has a considerable stock pile of ore. The ore from the Cuyuna range will go to the new dock of the Soo Line on the Superior, Wis., side of St. Louis bay. A considerable stretch of railroad track is still to be constructed, extending to the pier, and this involves the erection of about half a mile of trestle work. The Kennedy is expected to be the only shipper of the Cuyuna range this year. It is now employing a force of 200 men. Underground development thus far has been quite satisfactory.

The country's total exports in April, according to the figures just issued by the Department of Commerce and Labor, were the largest on record for that month, exceeding by $500,000 the very heavy exports of April, 1907, and those of April, 1910, by $25,000,000. Imports, on the other hand, were nearly $14,000,000 less than in April a year ago, and smaller than the April exports in three out of the last four years. The net result of these increased exports and decreased imports was an excess of exports for the month of $37,876,000, compared with an excess of imports in April, 1910, amounting to $853,000.

Obituary

NATHANIEL WRIGHT LORD, professor of mineralogy and metallurgy at the Ohio State University, Columbus, Ohio, died at his home in that city May 23, aged 56 years. He was born in Cincinnati. Mr. Lord has been long and prominently known in the technical world. He graduated at the Columbia College School of Mines in 1876; was chemist and engineer of the Monte Grande Gold Mining Company, 1879; chemist in charge of analysis of fertilizers for the Ohio State Board of Agriculture; consulting chemist Ohio Geological Survey; author of "Notes on Metallurgical Analysis," "Iron Manufacture of Ohio," "Natural and Artificial Cements," and numerous reports and papers for technical societies and scientific and technical journals. He was director of the chemical laboratory, United States fuel testing plant, St. Louis Exposition, 1894.

ALFRED B. DUFF, formerly connected with the Duff Patents Company, Pittsburgh, died at his home in that city May 20 from locomotor ataxia, after a long illness. He was born in Loftus, Yorkshire, England, December 16, 1865, and went to Pittsburgh in 1888. He retired from active business about 10 years ago on account of ill health.

A. N. SPENCER, vice-president and general sales manager of the Oliver Machinery Company, Grand Rapids, Mich., died at his home in that city May 18.

W. W. SLY, president and founder of the W. W. Sly Mfg. Company, Cleveland, Ohio, died at his home in that city May 22 of pneumonia.

LEHMAN S. KAHN, secretary and treasurer of the Evansville Stove Works, died at Evansville, Ind., May 16, aged 49 years. He was one of the best known iron founders in the city.

W. C. HEATH, for four years secretary of Spang, Chalfant & Co., Inc., died of heart failure at his home in Pittsburgh, May 23. He leaves a widow and two daughters.

New Publications

The Production of Malleable Castings.—By Richard Moldenke. Cloth bound; pages 132, 6 x 9 in.; illustrations, 35. Published by the Penton Publishing Company, Cleveland, Ohio. Price, $3.

Dr. Moldenke's experiences in the manufacture of malleable iron castings and his eminent fitness to write on methods used in their production are well known. The secrecy which at one time surrounded the processes of the malleable foundry has given away in the last few years to a willingness to discuss some of their features. The metallurgy of malleable castings is not a closed book, but there has been a great difference between the best and the poorest practice and it is not denied that the tonnage of poor malleable castings has been considerable. The author properly says that many problems of the practice in this line are still unsolved, but he believes that this first comprehensive work on the subject will serve to stimulate interest, not with a view to multiplying establishments but to improving those that exist. It is pretty well known that the number of malleable foundries has increased and in many cases without any addition to the sum of approved information on the process. The author meets the criticism which may be made that such a book gives away the business by suggesting that the man who really knows his business need not be afraid of progress.

It is laid down as a fundamental of the successful manufacture of malleable castings that after the right composition and proper melting have been obtained there must be the application of heat high enough and long enough continued to effect a change in the condition of the carbon present without its necessary removal or diminution. The enormous preponderance of malleable tonnage in the United States and Canada as compared with the rest of the world, the author attributes to two things. The first is the radical difference in machining practice. In England and on the Continent where labor is cheaper than in the United States it is customary to finish machine parts to a much greater extent than in the United States and hence much of the best part of the malleable casting is removed. The poorer, even spongy part of the casting has to stand the service strain and frequently fails, hence the more common use of steel castings. The second reason is found in the progressiveness of the American manufacturer. While in Europe comparatively thin sections are made, heavier and thicker work is called for in this country, chills being extensively used to get the metal white as cast. While the capital required to build and operate a malleable castings plant is four times that needed for a gray iron foundry of corresponding tonnage, the work is steady, great numbers of the same piece can be made and under long contracts a good profit can be made in prosperous times.

The author takes up at first the history and development of the malleable foundry industry and then passes to the characteristics of malleable cast iron, its testing and the methods of molding and melting. A chapter is given to the air furnace and another to the open hearth furnace, while a third deals with the use of gas producers in malleable foundries. Then in turn are taken up the questions of mixing the charges and the casting and annealing of malleable castings. The characteristics of malleable fractures are discussed in another chapter and one is devoted to the use of the pyrometer in the annealing room. A very brief final chapter deals with the cost of manufacturing malleable castings.

The author makes the criticism which has also been made of founders operating in other lines, that malleable manufacturers are not as well informed as they might be as to their own costs. Buyers have thus become accustomed to low prices and advances seem very hard to bring about except in times of abounding prosperity.

Dr. Moldenke has added to his other distinctions that of producing not only the first book on malleable castings but one that gives just the information the reader seeks and that is destined for a long time to stand as the authority on this subject.

Hydroelectric Practice.—By H. A. E. C. von Schon. Second edition. Size, 7 x 9½ in.; pages, 383; illustrations, 140. Bound in cloth. Price, $6.00, net. Published by the J. B. Lippincott Company, Washington Square, Philadelphia, Pa.

This is a revised and enlarged edition of a work which was originally published in 1908. The principal changes made consist of a detailed treatment of the market for electric current developed by a hydro-electric plant, flow discussion, pondage, storage of water, the scope and the equipment of development and the addition of an entirely new section on the operation and the maintenance of the plant. The tables of drainage areas of navigable rivers together with the forms of Government permits and licenses have been taken out since information on these points can be easily obtained from Government publications. No changes have been made in the cost estimates, which would seem to be desirable, as the figures given are based on conditions prevailing in the United States in 1907.

The work is divided into three parts, the first of which is entitled, "Analysis of a Hydro-Electric Project." This is written for the layman and is free from technical treatment. Five chapters are included in this division and treat of such subjects as the market for the current generated in a plant of this character and its value, the manner in which the power output is determined, the feasibility and practicability of the development and a synopsis of the cost and the investment value of such a project. In this part numerous diagrams for determining power of various kinds, flow of water, charges and revenue and approximate quantities required in the construction of the various parts of the project are included. The second part, which deals with the design and equipment of the plant, is intended for the student and the practical man. Five chapters are included in this division, each dealing with some phase of the work. These are arranged in logical sequence commencing with the preliminary work such as surveys and flow measurement and leading through a discussion of the different development programmes, types of dams and power stations and power equipment to a brief generalization in Chapter X on the preparation of plans, estimates, specifications and the engineering control of the construction work. Two chapters comprise Part III, dealing with the questions of operating and maintaining the plant. The first of these treats of the maintenance of all the structures entering into these developments, while in the other chapter the equipment and its operating and maintenance costs are taken up. Included in this latter chapter are tables giving the initial, the maintenance and the operation costs of steam power plants ranging from 50 to 500 hp. divided among the various items which go to make up the total investment.

Iron Ore Manual of the Lake Superior District.—By Rukard Hurd. Flexible leather binding; pages 162, 6 x 9 in. Distributed by F. M. Catlin, St.. Paul, Minn. Price, $7.50, postpaid.

The author is secretary of the Minnesota Tax Commission and his studies of Lake Superior iron ore resources and the values of Lake ores were at first connected with the investigations of that body. It was found that the information which should be embraced in a complete manual of Lake Superior iron ores was widely scattered and the work involved in the preparation of the book was by no means small. The principal questions which the book set out to answer are "What is iron ore worth?" and "How is its value determined?" In his opening pages the author takes up the method of determining prices and base unit values and develops the entire scheme of the producers for adjusting the price to the actual metallurgical value of the ore, taking for his purpose the base prices for 1911. Then follow a brief sketch of the work of the Minnesota Tax Commission in the valuation of iron ore, a chapter on "The Present Value of Iron Ore Royalties," and one on "Prospecting, Mining and Ore Estimating Methods in Minnesota," with special reports on the Mesaba and Cuyuna Ranges. Statistical tables are then given showing shipments by mines in 1910 and shipments by ranges in preceding years, together with rail and lake freights on iron ore; also statistics of production of iron ore and steel in the United States over a period of years. A chapter is given about the geology and mineralogy of the Lake Superior iron districts with some data on the iron ore reserves of the United States. Practically all the latter half of the book is taken up by tables of iron ore values based on the 1911 prices. These are given by ranges and are calculated for each 1-100 of 1 per cent. of iron, natural, between 45 and 61 per cent. for Old Range Vermillion Bessemer and Mesaba Bessemer, and between 45 and 60 per cent for Old Range Vermillion non-Bessemer and Mesaba non-Bessemer.

The author has done painstaking work and has produced a manual that will be of great permanent value.

Chemistry for Beginners.—By Edward Hart, Ph.D. Volume I., fifth edition, revised and enlarged. Bound in cloth. Size, 5 x 6½ in.; pages, 207; illustrations, 78. Price, $1.00. Published by the Chemical Publishing Company, Easton, Pa.

As the name indicates, the book is intended for use by elementary students, and in preparing the author has endeavored to produce a work which will give information on topics which all educated people should understand. In a large number of text books on this subject written for students, the majority of whom do not become professional chemists, too much material is often included and an attempt has been made to cultivate simplicity of statement and exclude all matter which is not essential in an elementary text book. The book grew out of the needs of the author, who is Professor of Chemistry at Lafayette College, in teaching large classes of beginners.

The more common elements are taken up first with experiments calling attention to their familiar properties, and this followed by notes on the constitution of matter, gases, liquids and solids and the less well-known elements. Electrolysis of the various compounds formed by the different elements is taken up and the latter portion of the book is given over to a discussion of the different metals. In this section of the work the concentration and the roasting of ores, assaying, blast furnace practice and steel manufacture are given more space than is customary in a general beginners' chemistry. Brief instructions are given on the subjects of volumetric analysis and the weighing of substances. One feature of the book which might be improved is the substitution of more descriptive matter regarding the various elements for some of the experiments.

Motion Study.—By Frank B. Gilbreth. Cloth bound; pages 116; 5½ x 8 in., illustrated. Published by the D. Van Nostrand Company, New York. Price, $2 net.

Few subjects are receiving more general attention from industrial managements than that of efficiency, and many men, in answer to the suggestion of the student and expert, are groping their way rather blindly to accomplish something in this direction in their works and offices. Mr. Gilbreth's volume, while dealing directly with bricklaying for the most part, contains interesting and important analyses, following the idea of the title. Most essential to him who would undertake the problem of efficiency in a practical manner is the system with which he performs his work. Mr. Gilbreth goes into the details with much minuteness, and his text and illustrations carry along an idea so intimately and thoroughly that an application to other forms of labor should not be difficult. The work contains an introduction from the pen of Robert Thurston Kent.

The Life and Life Work of Charles B. Dudley.—A memorial volume; pages 269, 6¼ x 9½ in. Published by the American Society for Testing Materials. Price, cloth bound, $2.50; leather bound, $3.

A volume published as a memorial to the president of a technical society is not common, yet no one who reads this book will have any other feeling than that the engineering world would have missed much had not this permanent record been made of so rare a life. An account has already been given in these columns of the occasion on which most of the tributes given in the book were publicly presented. Much material concerning Dr. Dudley's life work has been added, including the story of his life, written by Prof. Edgar Marburg. Copies of the book can be had by addressing Professor Marburg, the secretary of the American Society for Testing Materials, University of Pennsylvania, Philadelphia.

An Export Assisting Plan.—The Commercial Bureau Company, 50 Church street, New York, has been given the privilege by the Department of State to equip American consulates with the card catalogue index files as compiled by that company. American manufacturers are requested to prepare briefs of their catalogues or printed matter according to card index specifications, these cards to be classified in the card index files under appropriate headings and to be printed in the various commercial languages. Through this medium the American manufacturer may be enabled to reach all the more important consumers of his products throughout the world. The system permits of additions and corrections being sent at regular intervals to the files at each consulate. To make the work comprehensive and valuable, it is essential that the co-operation of manufacturers be secured. The Commercial Bureau Company states that the classification, compilation and distribution of these cards in quantities are to be done without charge to the manufacturer. Full particulars can be secured by addressing the company.

No Steel Plant at Blairsville, Pa.—Reports printed in the Pittsburgh papers last week to the effect that plans are under way for the building of a large steel plant at Blairsville, Pa., 50 miles east of Pittsburgh, in which it was stated that H. C. Frick and W. E. Corey would be interested, are unfounded. So far as can be learned by careful investigation, there is no basis for the report that a steel plant will be built there. It is officially denied that Mr. Corey is connected with any such project.

The Vanadium Mines Company.—W. A. Bonitz, vice-president of the Vanadium Mines Company, Frick Annex, Pittsburgh, states that its mines and oxide plant at Cutter, N. M., have made successful runs. The concentrating mill has been closed to allow extensions and enlargements to be made, which will increase the capacity of the mill from 100 tons to 200 tons per day. Operations will be resumed about July 1. The company's plant at Rankin, Pa., near Pittsburgh, has equipment for treating 1500 lb. of contained vanadium per day.

The Pittsburgh Emery Wheel Company, Park Building, Pittsburgh, Pa., manufacturer of adamite, borundum, corundum and emery wheels and grinding machinery, has just completed at considerable expense the relining of all the kilns in its plant at Rochester, Pa., and the placing of all its equipment in the best possible condition. It has also added considerable additional equipment, which places it in better condition than ever before for improving the quality of its product, as well as increasing its capacity about 25 per cent.

An order in council has been passed by the Canadian government appointing C. C. Schneider, of New York City, a member of the Quebec Bridge Commission of Engineers. Mr. Schneider, formerly president of the American Society of Civil Engineers, succeeds Charles McDonald, who accepted a place on the commission only until the contract should be awarded.

The Langelier Swaging Machine

A swaging machine with a pneumatically operated holder has been developed by the Langelier Mfg. Company, Providence, R. I. In this machine the work is fed into the dies and the opening and the closing of the chuck are effected by compressed air. Fig. 1 shows the holder in position ready for use while Fig. 2 illustrates the holder swung to one side for removing and replacing the dies and inspecting the swaging parts of the machine. In Fig. 3 a view of a typical series of operations performed by the machine is given.

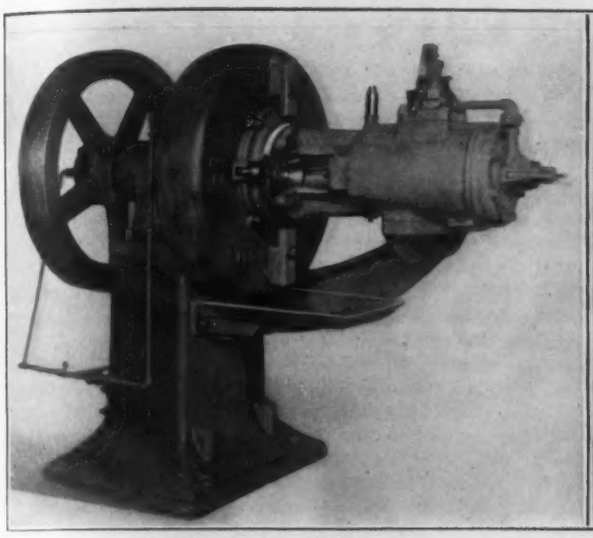


Fig. 1.—The Holder and Position for Use.

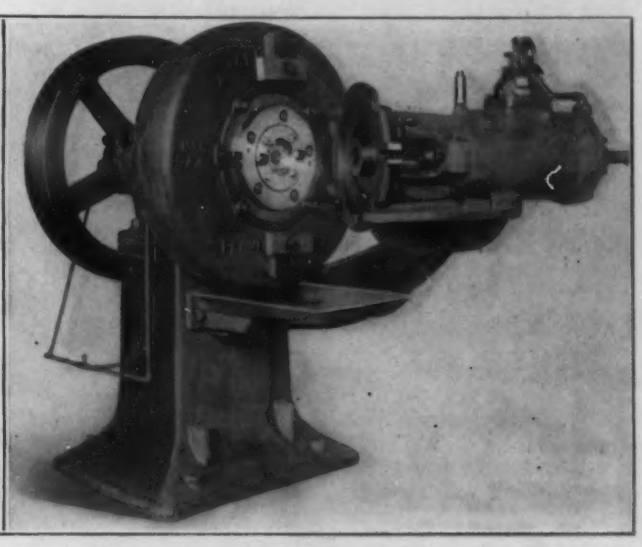


Fig. 2.—The Holder Swung to Inspect the Dies.

The No. 5A4 Swaging Machine with Pneumatically Operated Die Holder, Built by the Langelier Mfg. Company, Providence, R. I.

The holder consists of a cylinder hinged to the swaging machine cover as is clearly shown in Fig. 2 and supported at the outer end by a rail upon which it rides when swung to one side. The essential part of this holder is a pair of pistons which operate independently of each other. The main or cylinder piston controls the feeding of the work into the dies and its withdrawal while the other or auxiliary one opens and closes the chuck. A special type of triple-acting valve which is mounted on the top of the cylinder and has the air inlet and outlet at the rear controls the movement of both of these pistons. The oscillating part of the valve is so constructed that wear is compensated for and a uniform pressure maintained on its seat. It is operated by a hand and a thumb lever, the former controlling the feeding of the work into the dies and its withdrawal, while the latter regulates the closing of the spring chuck. The movement of the main piston, which comes in contact at the extreme outer end of its stroke with a piston valve, automatically releases the chuck, while the trip lever on the end of the cylinder head enables the chuck to be released at any part of its stroke.

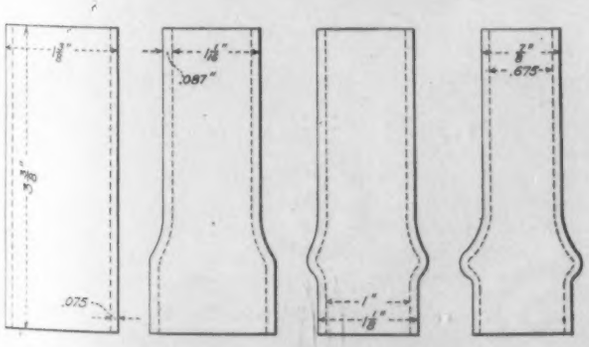


Fig. 3.—A Specimen Series of Operations Performed on This Machine.

An interesting example of some of the work made possible by the use of this machine is given in Fig. 3. The view at the left shows the blank which was a piece of brass tubing 1⅜ in. in diameter and 3⅜ in. long and the successive operations are given in order to the right. For doing this work a separate chuck and pair of dies were required for each of the three operations and also a swaging arbor for the last two to secure the desired wall thickness. In the first operation the diameter of the blank was reduced 5/16 in. for approximately three-quarters of its length. No swaging arbor was used in this operation since it was desired to secure as thick a wall as possible. In the next operation the diameter of the lower end was reduced ¼ in. to meet the reduction made in the first operation and in the final operation another ¼-in. reduction was made in the diameter, which was finally ⅞ in. In these last two operations the work was swaged on an arbor located between the dies and the swaging head. The time required for producing this piece of work including the chucking and ejecting of the work was 6 sec.

The Strong Steel Foundry Company.—The management of the Strong Steel Foundry Company, Buffalo, N. Y., maker of acid open-hearth steel castings, has been strengthened by the entrance into the active conduct of its affairs, in connection with O. H. P. Champlin, the president and treasurer, of James E. Keller, secretary. Mr. Keller, although interested in the company from its inception, was not actively engaged in its business management until April 1, but is now devoting his entire time to its service. The company has been fortunate in securing Edward Herms as superintendent of the foundry, succeeding E. C. Strong, recently resigned. Being a chemist and metallurgist of long experience and high standing, Mr. Herms will enable the company to improve the already superior quality of its products and to add thereto the manufacture of nickel, chrome, vanadium, titanium and manganese steel castings. A large amount of new equipment has been installed, placing the plant in a position to increase materially its output and to shorten the time on deliveries. The company contemplates the erection of new buildings in the near future to meet the requirements of its increasing business, plans for which are now under consideration.

The Jamison Coal & Coke Company, Henry W. Oliver Building, Pittsburgh, reports through W. A. Johnson, general sales agent, that it is operating 70 per cent. of its coke ovens and running its coal mines about 80 to 85 per cent. of capacity. Its new holdings at Underwood and Barrackville, W. Va., have an output of 3500 tons of coal per day, and this will be increased later on.

The Wisconsin Engine Company, Corliss, Wis., has sold through its Pittsburgh office to the Philadelphia Company, Pittsburgh, for installation in one of its stations on the Baltimore & Ohio Railroad, in West Virginia, a 1200-hp. cross-compound pumping engine, with gas cylinder 20 in. in diameter, high-pressure cylinder 26 in., low pressure 48 in. and stroke 60 in. Delivery will be made in June.

Steel Ingot Treatment*

Notes on the Welding Up of Blow-Holes and Cavities

BY J. E. STEAD

In general terms welding may be described as the crystallizing into union of two solid metallic surfaces when they are brought together under suitable conditions. That such is the case is proved by microscopic examination, for, on polishing and etching sections of the united metals, the crystals along the junction are found to be common to each of the original pieces of metal. In perfect welding there is no visible joint, for the line or plane of junction is occupied by crystals, portions of which belong to one piece of metal and portions of the same crystals to the other. When the boundaries of the crystals are coincident with the juxtaposed plane surfaces, it is evidence of non-welding, which is equivalent to saying that unless the crystals become common to the two pieces there is no welding.†

The celebrated "Coffin joint," effected by placing together the fractured ends of a broken bar and heating the junction to a red heat, out of contact with air, was undoubtedly the result of crystallization, and in the general sense was an example of true welding.

The conditions necessary for the welding of two metallic surfaces of iron and steel are:

1. The surfaces must be clean and free from any foreign infusible substance, such as oxide of iron, slag, lime, etc.

2. The metallic surfaces must be in actual contact.

3. Given the conditions in 1 and 2, the higher the temperature the more rapid is the crystallization or welding together of the surfaces placed in juxtaposition; indeed, one often notices that, when a blacksmith allows two pieces of highly heated steel or iron to simply rest on one another, welding at the points of contact is instantaneous. The subsequent hammering brings the whole of the surfaces in contact and incidentally squeezes out the liquid intervening slag, and in this way conditions 1 and 2 are obtained and good welding produced.

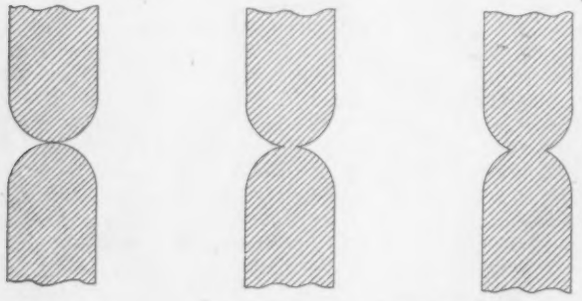


Fig. 1.—Experiments in Welding Round Ended Prisms of Steel.

It is well known that iron and steel will crystallize, or weld together, at temperatures far below the so-called welding point, as has been proved by Coffin and others, but so far as we know systematic trials have not been made with steels of varying and given composition with the object of determining at what temperatures they will actually unite. The experiments which follow were made as a preliminary essay in this direction. The steels selected contained between 0.1 per cent. and 1.40 per cent. carbon.

Experiment Series No. 1

In this series small sections of three different steels in duplicate, containing 0.1, 0.5 and 1.4 per cent. of carbon, having the dimensions of 10 x 10 x 5 mm., were ground down on one of their sides to plane surfaces, polished and placed face to face in a porcelain tube, and were heated in an atmosphere of hydrogen gas for 2 hr. at a temperature of 900 deg. C. After cooling, the steels were removed and examined; in each case the surfaces had crystallized together so firmly that they could not be easily separated. By using a chisel and hammer they were burst asunder. On examining the pieces it was seen that the metals had crystallized together at a few isolated points, for the surfaces at these positions had a cystalline fracture. All of the samples with 1.4 per cent., 0.5 per cent., and 0.1 per cent. of carbon appeared to be equally welded. In duplicate experiments the welded specimens were sectioned through the two pieces and the surfaces polished and etched. In each case along the junction, in certain spots, the crystals were common to each piece, that is to say, they were continuous from one piece into the other. On heating corresponding pieces to a temperature of 800 deg. C. for 2 hr., they welded together at some points, but the areas welded were not quite so great as in the pieces heated at 900 deg. C.

The reason for the welding only having occurred at certain spots is attributed to the inequality of the surfaces placed together, and that the second condition necessary for perfect welding was absent. There is little doubt that the welding would have been perfect had the surfaces been true planes, or had sufficient pressure been applied during the heating period to bring the whole area of the faces into actual contact.

Experiment Series No. 2

The experiment described above was repeated, but under slightly different conditions, for instead of flat pieces short prisms, cut in duplicate from bars of steel were substituted. They were shaped in a lathe so as to leave one end of each semispherical and the other end flat.

In each experiment the rounded ends of the duplicate pieces were placed so as to touch each other, and were put into a porcelain tube, and kept in contact by gentle pressure. After heating for 2 hr. in hydrogen gas to a temperature of 800 deg. C., the pieces in each class of steel were found to be welded at the points of contact. On breaking them asunder the fractures at the joints were found to be crystalline, and measured about 0.5 mm. across.

In these trials, where the metals were in physical contact, crystallization or welding was complete and perfect.

Further trials conducted at temperatures of 900 deg. C. and 1000 deg. C. respectively yielded similar results, with this difference, however, that with the higher temperatures the areas of the surfaces actually welded were slightly greater than in those heated to 800 deg. C.

It is well known that piled sheets of relatively pure steel, when rolled at temperatures certainly below 900 deg. C., not infrequently stick together at certain points where the steel is free from oxide, and require great force to separate them from each other, and in some cases separation cannot be effected without tearing the sheets. In an extreme case of such sticking, two sheets at the point where they adhered were sectioned, polished and etched, and were examined microscopically, when it was found that the crystals of one sheet passed into the other, evidence of true welding, and this was effected by heating and rolling at a temperature far below that at which welding is considered to be possible with such material.

Experiment Series No. 3

Further trials were made with the round-ended prism of steel, to determine what would follow on heating them when in contact, at a temperature between 1300 and 1400 deg. C. For this purpose a complete series of pieces were placed, rounded ends in contact with each other, inside a wrought-iron tube, and this after hermetically sealing was put into a ladle containing about 4 tons of molten slag.

As it was found afterward that the tube with contents was in an inclined position, it is possible the pieces of steel inside pressed against each other by gravity. The tube was allowed to remain in the slag till cold; the slag ball was broken up and the tube removed. On examination the two pieces of steel containing 1.4 per cent. carbon were found to be porous, and that a liquid phase had

*A paper read before the Iron and Steel Institute, London, England, May 10 and 11, 1911.

†There can be no disputing of this law, or that the skilful microscopist can with absolute certainty determine whether or not steel or iron surfaces are crystallized or welded together, a matter of exceeding importance when considering the question as to whether cavities in steel ingots can or cannot be welded up.

liquated out and become fused on to the side of the tube. No liquation had taken place from the steels of lower carbon. All had become perfectly welded at the rounded ends, and the areas of junction or welding varied between 3 and 5 mm. in diameter. Fig. 1 illustrates what had happened.

The distance between the flat ends of the welded pieces was slightly less than before heating, but the corners of the square or flat ends of the steel with under 1 per cent. carbon were not altered, and remained square and sharp, a proof that they had not approached the melting point, otherwise they would have become rounded by the influence of surface tension.

Experiment Series No. 4

In another trial a bundle of seven round steel bars ½ in. in diameter, tied together with wire, Fig. 2, was dropped into a ladle of molten slag and was allowed to cool with the slag. It was found that the steel, when cold, had become welded at the points of contact, and had coalesced or been drawn together to a considerable degree, a phenomenon suggesting that, had the heating been continued for a sufficient length of time, the bars would have coalesced to such an extent as to make one solid bar. That surface tension was not responsible for this peculiarity was proved by the fact that, in this as in the previous cases, the corners or sawed ends of the bars, were not rounded in the least, and the most delicate stampings and scratches on the outside of the bars were not effaced.

Experiment Series No. 5

In crucible steel works practice it is sometimes the custom to heat the steel to, and forge from, what is called the "wash welding" temperature, and it is assumed that if the material initially contains cavities or blow-holes, they will be welded up. To determine whether larger cavities than blow-holes could be so welded, a series of trials on a practical scale were made by F. M. Parkin, at the Don Steel Works, Sheffield, by the permission of the proprietors, Hobson, Houghton & Co., with the object of determining whether artificially formed pipes or cavities in steel could be welded up by wash-welding and forging, and at what temperature this could be effected.

With this object square bars 8 in. x 2 in. of Swedish Bessemer steel containing 0.15 per cent. of carbon were drilled down one end of each to a depth of 7 in. with a ½-in. drill, leaving a soldid bottom of 1 in. Taper plugs of the same material 1½ in. in length were also prepared. To displace the air from the drill holes, a few drops of petrol were introduced, and afterward the taper plugs of steel were driven forcibly into the open ends.

The closed and "piped" bars were heated to 800 deg. C., and after being removed from the fire were gently flattened under a 12 cwt. hammer, so as to close up the cavities, after which they were heated respectively to 750, 950 and 1150 deg. C. for 30 min., and were forged down at these temperatures into 1 in. square bars. When cold they were nicked at intervals, broken, and examined both by the eye and also by the microscope on cut and polished specimens and by bending cross sections cut across the central axes. In the piece heated at 750 deg. there was no evidence of welding. In the piece heated at 950 deg. welding had occurred at the lower end only, while the bar heated to 1150 deg. was perfectly welded and sound from end to end. A second trial was made with a steel containing 1.40 per cent. of carbon. This was prepared, as described in the previous case, with an artificial pipe, and was heated to between 1050 and 1100 deg. C. It was forged in the manner described above. After

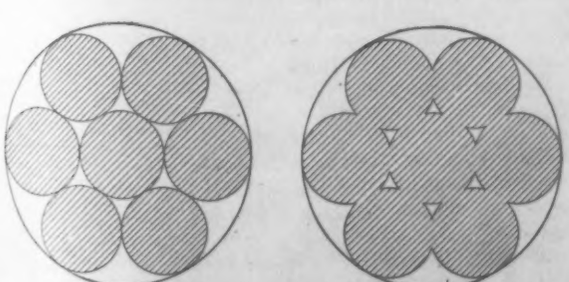


Fig. 2.—Experiments in Welding Round Steel Bars Tied with Wire and Dropped in Molten Slag.

Fig. 3.—Fractured Surface of an Ingot Solidified from Very Mild Steel.

cooling it was found that, except near the upper plugged end, the welding had been satisfactory; there was no trace of unsoundness or hollowness.

Experiment Series No. 6

A third experiment was made with a bar of 2½-in. square crucible steel, containing 0.9 per cent. of carbon. A central hole was drilled and plugged, and the metal, after heating to a yellow heat, was forged into a ⅞-in. octagon bar, and was cut up and forged into chisels, which were put to practical use. The chisels did their work admirably, and there was no indication whatever of unsoundness.

These results prove conclusively that when two metallic surfaces quite free from oxide or any foreign matter such as slag, sulphide of manganese, alumina, etc., are brought together and are forged *under the conditions given above* at temperatures about 1100 deg. C., they do weld up completely. The italics are introduced to make it clear that the conclusions are based on a definite method of treatment. It has been shown that steels containing between 0.1 and 1.4 per cent. carbon will crystallize together at temperatures of 800 and 900 deg. C., when their plane surfaces are in contact, and are heated for 2 hr. but that little or no welding was effected on heating the artificially piped forged steel for half an hour at 750 and 950 deg. C. and forging afterward.

The great difference between the two results suggests that if the piped pieces, in which central holes were drilled, after the preliminary forging, made to bring the walls of the cavity into actual contact, had been heated for a much longer period, the sides would have crystallized together even before the second forging. It is not certain, however, that the first forging would leave the faces in physical contact.

The author believes there is strong ground for the presumption that if the faces of a closed up pipe are crystallized or welded together at several separate points only, and not completely, forging at relatively low temperatures, say at 750 or 850 deg. C., tends to cause disruption of the primarily united portions, particularly in cases where the steel is rolled to small sections. The reason for this hypothesis is that juxtaposed faces probably do not always flow evenly when the steel is being forged or rolled, and that, if one face flows in advance of the other, disruption of the parts united occurs, due to shearing effect.

It is well known that even in quite sound material it is possible to produce internal disruption by a special rolling process, and, if it can be effected in sound steel, how much more readily must it occur in initially imperfectly welded material.

How Blow-Hole Cavities Are Developed

Professor Howe has given a very characteristic definition of the genesis of blow-holes. He says: "The blow-

holes represent (a) the progressive concentration in the molten or liquid mother mass of the gases initially present, a concentration carried on to supersaturation, and to the liberation of part of this gas from the supersaturated layers; and perhaps (b) in some cases, such as that of the solidification of steel ingots, the formation of a gas from chemical reaction brought about by fall of temperature, or by passage from the liquid to the solid state. In the case of steel ingots there are indications that carbonic oxide is thus formed during solidification by the union of oxygen and carbon present side by side in the molten metal."

It is well known, and therefore may be referred to briefly here, that if the steel has been in contact with more or less excessively ferruginous slag, previous to being poured, the metal is more or less highly charged with oxide of iron; and that if no metal or metalloid—such as aluminum, silicon, titanium—capable of reducing this oxide is added to the liquid steel on cooling down, the chemical reaction referred to by Professor Howe will follow, and the steel will give off gas and produce honeycombed ingots.

On the other hand, if the slag toward the termination of the finishing is rich in silica and low in oxide of iron, the oxide dissolved in the metal may actually absorb any excess of oxide dissolved by the metal at an earlier stage of the process.

It is possible that an excessively limey slag in the basic process, provided it is coincidentally impoverished in iron oxide, may also act in a similar manner.

Liquid steel, which gives off gases during cooling through the fluid state, always continues to yield gas during the period when the steel is plastic; these bubbles cannot escape, and the cold metal is in consequence always

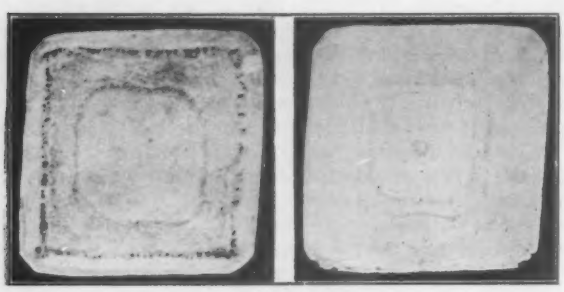


Fig. 4.—Section of a Billet Rolled from a Honeycombed Steel Ingot.

Fig. 5.—Section of a Billet Rolled from Some of the Same Liquid Steel Treated with Aluminum.

more or less "honey-combed." In every gaseous steel it is difficult to keep the metal in the molds, for when the upper part of the steel is passing through the plastic stage, the gases continue to be evolved from the still fluid liquid below, and in the semi-solid steel at the top a frothy mass is formed which ascends and flows over the sides of the mold. In such a case it is usual to chill the upper liquid layer, cover it with sand and plate it down; by doing this the gases are prevented from escaping, and must incidentally exert very great internal pressure. Cases are on record where the pressure was so great that, after the steel in the ingot had been plated down, it burst the layer at the top, and lifted the mold itself from its base. Although this ingot when cold was not broken, there can be no doubt that it was extremely honeycombed. Fortunately, another ingot, solidified from very mild steel, was obtained at a later date, and the fractured surface was photographed. This is shown in Fig. 3, from which it will be seen that approximately one-third of the whole mass is occupied by gaseous honeycomb cavities, which radiate from the outside toward the center. The uneven section of the ingot was produced when being broken. The billets rolled from this ingot were naturally much "roked" by longitudinal fissures, which, however, did not penetrate to a depth of more than 1 mm. Below this the blow-holes appeared to have been completely welded up.

The Least and Most Objectionable Positions of Blow-Holes

It is recognized that the blow-holes are in the least objectionable position when they are located well within the external surface of the ingot, and steelmakers endeavor to fix the composition of the steel so that they will occupy that position. The most objectionable position they can occupy is close to the external skin.

Many years ago the author's attention was drawn to some ship plates rolled from ingots of the honeycombed character just mentioned. The heating of the ingots had been so elevated as to oxidize the thin outer layer of solid steel and melt the scale on the surface, and this had run down and filled the honeycomb cavities, so that when the ingot was rolled the oxide remained imprisoned near the surface; and when cold, and the plates were struck with a hammer, little pieces of oxide jumped out, leaving unseemly pits on the finished plates, which, of course, on that account had to be rejected.

It is impossible to tell exactly how the gases become located in independent centers in steel ingots separated sometimes by considerable masses of steel. When a cork is removed from a bottle containing soda water, it is seen that after the first ebullition small bubbles form at the bottom of the bottle, and as these ascend they become larger and larger due, no doubt, to gas being freed from the liquid and taken up by the primary bubbles through which they pass; but in the case of bubbles which form in a semi-solid mass of steel, and do not move, a different explanation is necessary. They must at first be very small, and afterward develop to larger sizes, and this must be effected by the passage into them of gas from the surrounding plastic, not liquid, steel. It is almost certain that, at the time the bubbles form, the plastic metal consists of a mass of crystallites of purer iron and a liquid rich in carbon, sulphur and phosphorus, and that the primary bubbles form at relatively wide distances apart; and the gases which continue to pass out of solution from the surrounding plastic metal escape from it, and pass into the nearest bubbles, along fine channels which close up again, and in doing so coincidentally force some of the liquid into the cavities. As this must continue for some time—probably until the metal is completely solid—the bubbles gradually increase in size. When the liquid inside the ingot is inclosed in a solid shell of steel, and the gases still continue to be evolved, pressure must be exerted on the plastic mass, and this most probably expresses some more of the liquid, rich in metalloids, into the initially formed blow-holes. Examination of the fractured and cut surfaces of honeycombed ingots has yielded proof that the honeycomb cavities are lined with metal rich in sulphur and phosphorus.

Blow-Holes Contain Both Gas and Concentrations of Metalloids

In the above remarks the author has endeavored to explain what occurs when blow-holes form, and to account for the fact that the blow-holes in all commercial honeycombed ingots contain not only gas but concentrations of the metalloids.

The blow-hole segregations are clearly illustrated by Fig. 4 of a billet rolled from a honeycombed steel ingot, while Fig. 5 was of a billet rolled from a portion of the same liquid steel made free from honeycomb in a separate ingot by the addition of a little aluminum.

It will be seen, then, that where these blow-hole segregations are detected in rolled steel, one may be quite certain that they were at one time coincident with actual cavities, and that as one can thus locate with certainty where they exist by etching the polished steel, it is possible by microscopic examination and by bending the etched pieces to find out whether they have been welded or not, for, if they were not welded, the original faces of the unwelded cavities would at once open out into fissures, and the crystals would not be found common to the side of the blow-holes closed up.

Professor Howe has also made a special examination by the bending method of boiler plates rolled from a honeycombed ingot, and says that "on bending the cut and polished sections double in such a way that any blow-hole traces present ought to gape open like the cards of a bent pack," but as a matter of fact he found only traces where this actually did occur, "which were so short in length as to indicate strongly that a very great degree of welding had occurred," and suggested that these relics of blow-holes tend to show that the blow-hole gases had been reabsorbed by the metal to a very great degree. He then suggested "prolonging the exposure of forged blooms to a temperature above the welding point so as to complete the reabsorption of the gas while the metal is still weldable."

Although the author has examined many specimens of rails, forgings, and plates rolled from honeycombed ingots by bending, he has rarely found that they behaved in the manner described by Professor Howe, unless there existed distinct particles of slag or manganese sulphide,

which would, of course, prevent the metallic surfaces from coming in contact and welding together. That welding up of the blow-hole cavities in ordinary practice is, as a rule, complete and perfect has been proved by microscopic examination of a large number of specimens at the points where blow-hole segregations indicated that small cavities had originally existed.

Piping in Ingots

Piping in steel ingots is always coincident with the complete or partial absence of blow-holes, or evolution of gas from the steel when it is in the plastic state. When gases are liberated in sufficient quantity, piping is impossible.

All steel in cooling toward the point of solidification contracts, and as solidification proceeds from the cold sides of the molds in an inward direction, and when no gases are evolved in the steel as it passes through the plastic state, the liquid contracts and sinks down the center, leaving a pipe or cavity, but if gas is evolved it causes the whole mass of plastic steel to expand, which more or less balances the contraction of the metal still remaining liquid, with the result that no pipe or very little pipe can form, or the volume of plastic steel and the gases together may increase and cause the metal to froth over the top of the mold.

When making commercial structural steel, manufacturers usually aim at having the metal in the condition so that it shall not pipe or that it shall yield sufficient gases to cause the mass to expand as a whole—in other words, so that the volume of gases evolved in the plastic steel is equal to the contraction of the liquid metal.

In cases where the cavities consist of central continuous pipes, long experience has shown that finished rails and forgings made from piped steel ingots are almost invariably unsound in the parts where the pipe existed, and that welding together of the walls of the pipe cannot be depended upon, and, as a result, it is usual to reject the parts of ingots in which there is a central cavity when the object is to obtain perfectly sound finished material.

It is obvious that if the uppermost layers of steel in an ingot could be kept fluid across the whole area or section till the metal from the bottom to an inch below the surface had solidified there would be no piping, and if the steel were of a non-gaseous character there would be no blow-holes. This fact is fully recognized by steelmakers and various methods have been suggested, and some of them adopted, to obtain, as near as practically possible, that condition:

(*a*) By very slow teeming the steel into the molds, so as to give the portions poured in advance time to contract and even solidify before the molds are filled.
(*b*) By keeping the uppermost layers liquid by heating with a blow-pipe flame, and, with the same object, pouring liquid steel slag on the surface of the metal.
(*c*) The surface layers have been superheated by the introduction of a thermite reagent.
(*d*) By lining the upper parts of the molds with loam or fire-brick.
(*e*) In the casting of crucible ingots, the introduction of highly heated fire-clay cores, which are placed on the surface of the liquid steel in the mold, and filled with a portion of the steel retained, for that purpose, in the crucible.
(*f*) By slow teeming into inverted ingot molds, *i. e.*, with the wide ends of the molds uppermost and the small ends down.

Freedom from piping is also effected by compression of the steel in the ingots during its solidification.

Composition of Gas in the Cavities

Although much work has been done by Graham, Parry, Troost and Hautefeuille, Howe, Boudouard, Belloc, Muller, Stead and more recently by Thomas Baker, to determine the composition of the gases occluded in steels, it is not certain that sufficient gas from blisters in steel, or from the honeycomb or closed pipe cavities in ingots, had ever been analyzed before the author was afforded the excellent opportunity of actually collecting, and having analyzed a sufficient quantity of imprisoned gas from a blister in a thick steel plate low in carbon. The analysis of the gas was as follows:

	By Volume. Per Cent.		Bv Volume. Per Cent.
Nitrogen	5.83	Hydrogen	17.17
Carbon dioxide	23.00	Methane	3.50
Carbon monoxide	50.50		
		Total	100.00

It is scarcely necessary to state that the mixture of gases inclosed in this particular steel may not be typical of what is present in the blow-holes. As a matter of fact, the gas collected was obtained from the central axis of the plate, and must have been inclosed in the pipe cavity, and not in the blow-holes. For comparison, an analysis of the occluded gases extracted by heating in vacuum by Baker, from a steel containing about 0.9 per cent. carbon, is given herewith. The heating ranged between 519 and 1016 deg. C. Baker found that hydrogen was evolved in preponderating quantity at between 500 and 600 deg.

	Steel Free from Blow-holes. Per Cent.	Steel Containing Blow-holes. Per Cent.
Nitrogen	0.08	0.48
Carbon dioxide	1.68	0.87
Carbon monoxide	45.53	42.36
Hydrogen	51.99	54.56
Methane	0.72	1.73
Total	100.00	100.00

The peculiar and remarkable feature in the analysis of the gases from the blister in the plate referred to above is the very large proportion of carbon dioxide and methane.

It is not uncommon to find small blisters on black tinplate sheets, after they have been annealed, but the author has never been able to obtain sufficient of the imprisoned gas for analysis. He has found in one or two cases traces of ferruginous slag in the neighborhood of the blisters, and considers it possible that there might have been chemical action between the oxide and the carbon of the steel, with the production of the carbon monoxide. Whether or not this was the case, or that they represented relatively rare cases where the honeycomb cavities had not been welded, the original gas having been compressed to a thin layer, so as to prevent the sides of the pressed out cavities coming into actual contact, cannot be definitely stated. It is probable, however, that the blisters were originally honeycombs in the ingot, that for some cause welding had not been effected during the rolling, and that the original gas, or that produced by chemical action, exerted sufficient pressure to produce the blisters, when the black sheets were subjected to an annealing process. It is impossible to conceive that gas generated in absolutely sound material, free from internal lamination, could produce lamination and blisters.

One is inclined to favor the view that the blisters correspond to portions only of the original flattened blow-holes, and that the points where the blisters appear are the places where traces of ferruginous slag have been present, which would not only be the means of preventing the surfaces coming into actual contact, but would react on the carbon of the steel and generate carbon monoxide.

The well-known blister steel produced by carburizing Swedish soft iron bars, which always contain more or less rich ferruginous slag, stratified at intervals between the layers of iron, illustrates fully how blisters can be and are actually produced by the generation of gas by the interaction of the oxide and the carbon of the metal. The oxide keeps the metal on each side of it from crystillizing together; the gas is generated at these points and blisters are the result.

On examination of the inside of the blisters, there is no longer any free oxide, a result one would expect, for the oxide no longer exists as such, having been reduced to metallic iron. The author suggests that for a similar reason oxide of iron is not always found in the inside of blisters in thin steel plates or sheets.

It may be noted incidentally that on cementing pure soft steel, which is free from local laminations of included oxide, no blisters appear.

A most instructive experiment suggests itself at this point, namely to forge a blister bar at a low temperature and heat it to a high temperature or pass it again through the cementation furnace, and determine if the blisters appear again in the same places and of the same size. If they do it must be assumed that the gases were only compressed and exerted their pressure when the steel again became plastic and were not absorbed in the steel.

Conclusions

Judging from the evidence advanced, it seems certain that if the blow-holes in steel ingots are subcutaneous and the heating of the metal is sufficiently high, say 1000 deg. C. and above, and the ingots are then rolled or forged they weld up completely unless the cavities themselves contain foreign matter. The wash welding, as practiced in Sheffield, and the heating and rolling of steel for rails and billets effect this.

It is, however, doubtful whether the pipe cavities can be so readily welded. The upper ends of the pipes in ingots are open to the gases of the heating furnace, and

the walls of the cavities become coated with oxide scale, which effectually prevents the metallic surfaces from coming into contact. When, however, the pipe is deep and is bridged over at intervals with diaphragms of solid steel, it is not improbable that welding below these bridges might be effected, provided that the imprisoned gases become forced back into the steel and do not form layers of highly compressed gas between the steel surfaces and so prevent these surfaces from coming into direct contact.

It is a fact observed by the author that the surfaces of the walls of the pipes in commercial ingots containing 0.06 per cent. or more sulphur are rich in manganese sulphide, and this must interfere with the perfect contact of the metallic surfaces, for from a practical point of view manganese sulphide is equivalent to scoria or slag.

Professor Howe's suggestion that the forged steel blooms should be heated for a long time to above the welding point, so as to complete the reabsorption of the gas, is based on two assumptions; first, that the gases of the cavities are capable of being forced, by pressure, into the hot steel and become occluded there; and, second, that what is not so forced into the metal will diffuse into it during prolonged heating at a high temperature.

Like all Professor Howe's contributions to science, this suggestion opens the door to a great field of research. Professor Howe will be the first to admit that if solid steel can have gas forced into it there is a limit to this, and that saturation will in such a case vary according to the pressure. The question at once arises, if the amount of gas pressed into the steel depends on the pressure and this pressure is partially removed, will not the gas, or a portion of it, pass back again into a cavity producing a blister? Again, if the gases are capable of being forced into the steel at high pressure and the steel be only red hot at the termination of the pressing or forging will not heating to a temperature above the welding point make the steel so soft and plastic that the imprisoned and highly compressed gas still unabsorbed will exert its influence and enlarge the chamber where it is located rather than pass into the heated steel? That this has occurred is proved by the blisters which sometimes form on reheating plates rolled from very much piped steel.

As we do not know the quantity of mixed gases or of any gas that can be forced, by pressure, into solid steel, or how much of it will come out again on removal of the pressure, it is evident we must have actual experimental evidence, and Professor Howe's suggestion calls for this. We do know, however, that gases occluded in solid steel at a high temperature and at atmospheric pressure can be removed at that, and even lower temperatures, by reducing the pressure. Presumably it is justifiable to conclude that the amount so removed could be returned to the steel if heated in the gas under pressure.

It is hoped that some one, who has the time and opportunity, will endeavor to determine what quality and quantity of gas, solid steel of different compositions is capable of having forced into it at varying temperatures and pressures. It is a question which a Carnegie scholar might try to solve.

A Labor-Saving Staybolt Press

A new type of press for forming square heads on boiler staybolt blanks at one stroke has been built by the Ferracute Machine Company, Bridgeton, N. J. This tool is equipped with a set of dies so that the head is formed and the blank is cut from the bar at the one stroke. The company to whom this machine was supplied formerly cut the blanks from the bar and subsequently placed them in a slotter to have the ends formed. In this way the rate of production was one per minute while with the new arrangement both operations are performed simultaneously at the rate of 30 per minute. At the time the photograph was taken from which the engraving was reproduced the operator was making ⅞-in. staybolt blanks from a steel bar of that diameter.

The press is of compact construction and the frame is a solid casting with but 14 in. between the columns, an arrangement which reduces any springing of the frame while in use to a minimum. The stroke of the press is 2 in. long and the ram is forced upward by the action of steel toggles which are straightened by the 6-in. steel shaft at the back of the press. The forming dies are V-shaped and the head to which the upper one is attached has a ½-in. adjustment through the medium of a wedge adjustment operated by a bolt and a lock nut. This bolt holds the head firmly against the frame and a spring having sufficient tension takes the weight of the head when the wedge adjustment is being operated. The press runs continuously and the ram makes 30 strokes per minute. The 40-in. flywheel operates at a speed of 180 r.p.m. and weighs 1100 lb. The complete weight of the press is over 16,000 lb. and the ram exerts a pressure of 400 tons.

A New Press for Forming Staybolt Heads Made by the Ferracute Machine Company, Bridgeton, N. J.

The second local meeting of members and guests of the American Institute of Mining Engineers will be held Friday evening, May 26, in the assembly room of the United Engineering Society Building, 29 West 39th street, New York. Dr. James Douglas will give a lecture illustrated by lantern slides on "The Copper Queen Mine, Bisbee, Arizona." The lecture will be preceded by an informal dinner at 7 o'clock at the Engineers' Club, 32 West 40th street, attended by members and guests.

The Prony Brake.—The well-known general type of power-absorption brake for measuring the output from prime movers, called a prony brake, says the *Electrical World*, is attributed to the celebrated French engineer of that surname. It is just as well, perhaps, that only the surname is applied to the device, because his full name was Gaspard Clair François Marie Riche de Prony, who lived from 1755 to 1839. The prony brake, as applied to measuring the power of motors, has taken a variety of forms in detail. The principal idea running through all of them is that the load torque applied to the machine under test shall be susceptible of adjustment as well as measurement. It is desirable, moreover, that the application of the brake to the motor shall apply no appreciable stresses other than the measured load torque. The product of this torque into the speed of rotation of the motor, in appropriate units, gives immediately the output of the machine in watts absorbed by the brake. Except in the cases of the smallest machines, the power absorbed by the prony brake brings the heat-dissipating power of the apparatus to a severe test and means have to be provided to keep the motor and brake cool.

The Prime Steel Company, Milwaukee, Wis., states that the recent fire at its plant was confined to the roof of its main foundry and that it did not interfere with the operation of the plant.

The Hooper Continuous Pouring Spout

A new device to insure continuous pouring of metal from furnaces and particularly from reverberatory and open-hearth furnaces has been developed by George K. Hooper, and is being handled by the Hooper-Falkenau Engineering Company, 165 Broadway, New York City. The device is intended to overcome the practical troubles and economic disadvantages arising from intermittent pouring from furnaces of this character. By its use the melt from open-hearth steel furnaces can be drawn into a number of ladles without stopping the flow, thus doing away with the necessity for employing very large ladles and slow and heavy cranes. By its use savings in time, temperature and metal are claimed to be effected; while at the same time an increase in the size of the furnace is possible which enables it and the labor and the machinery employed in connection with it to be used at the greatest efficiency. A saving in the amount of metal used and also in cleaning the floors is effected by employing this device, since there is practically no drip and with the reverberatory furnaces it is possible to draw metal from several spouts simultaneously, thus enabling straight or parallel floor foundries to be advantageously served by mechanical handling appliances.

A New Device for Continuous Pouring from a Reverberatory Furnace Made by the Hooper-Falkenau Engineering Company, New York City.

The continuous pouring device consists of an additional tilting spout located at the end of the regular one and moved back and forth by a lever and rocker arm operated by an air cylinder. Eight of these spouts, the first to be placed on the market, have been in use for more than a year in a large malleable iron foundry producing a specialty. The four furnaces of this plant have a capacity of 45 tons each and have been emptied in approximately 45 min. Without this device, but with the same handling appliances, 3½ hr. was required for the work by actual test. Overhead monorail travelers are used for placing the empty ladles at the spout and removing the filled ones, the engraving showing clearly how the respective channels of the spout move automatically out of the way of the filled ladle, permitting it to be lifted by an overhead traveler or crane and permitting also an empty ladle to be placed in position for filling. The ladles used in this foundry hold 1200 lb. and the advantage of rapidly handling this small size is apparent when the weight of the largest casting poured, 80 lb., is taken into consideration. In this plant only two men, one to each pair of furnaces, are required to operate the tilting spouts. The air passes through a two-way valve which is connected to the cylinders actuating the mechanism of the tilting spouts. In this way the air is admitted to the ends of the cylinders alternately and the metal is poured first from one leg of each spout and then from the other.

The Orenstein-Arthur Koppel Company

The Orenstein-Arthur Koppel Company, Koppel, Pa., manufacturer of portable and industrial railroads and equipment has completed the erection of new buildings and other developments of its property which have resulted in the doubling of the capacity of the plant. The old erection shop, which was 75 x 250 ft., has been increased by a building 75 x 300 ft. The machine shop has been doubled by an addition 75 x 100 ft. The light car shop has been supplemented by a heavy car shop 75 x 175 ft. The new carpenter shop is 50 x 125 ft., two stories; the tool repair rooms, 50 x 75 ft.; a new tool storage room 50 x 75 ft., while the boiler room and power house have been increased proportionately.

The company has plants in Germany, France, Russia, Spain and Austria. The works at Koppel, which supply the American market, were inadequate for the demand of so rapidly increasing a business, and it became imperative that an extensive plan of expansion be carried out. Ultimately, under plans already perfected, the present floor area of nearly 140,000 sq. ft. will be increased to 300,000.

Koppel is a new community which has grown up about the works of the Orenstein-Arthur Koppel Company. It is located on the edge of the Pittsburgh district, and within the so-called Youngstown-Sharon district, and is served by the Pennsylvania and the Pittsburgh & Lake Erie railroads, and is on the route of the proposed Lake Erie and Ohio River ship canal.

Puddlers will receive a reduction of 12½ cents a ton in their wages for May and June. The new rate was determined at the bi-monthly examination of the sales sheets of the Republic Iron & Steel Company and the Western Bar Iron Association in Pittsburgh. The examination showed that the average price of bar iron is on a 1.25 cent card. This entitled puddlers to $5.62½ a ton, against $5.75 paid in March and April.

The Ingram-Richardson Mfg. Company, Beaver Falls, Pa., has bought a 300-hp. Buckeye engine, directly connected to a Crocker-Wheeler generator, which will furnish power for a large addition now being built to its plant.

The Pittsburgh Plate Glass Company proposes to build a new plant at Port Mann, British Columbia, having found silica of the best quality and in large quantities in that district.

Cutting Worm Gears with a Fly Cutter

A Recent Development of Schuchardt & Schütte

Hobbing a worm wheel with a straight hob is satisfactory only when the angle of the hob thread is slight as is the case in large diameter single-thread hobs. With an increase in the number of threads and the angle the straight hobs give a rough and unsatisfactory job as high ridges are left on the teeth which cause the worm to wear in spots when in service. The length of the hob is determined by the diameter of the gear blank being cut and this distance must at least be the same as the length of the worm. This method of cutting gear blanks is also expensive and a satisfactory solution of the problem is afforded by the use of an ordinary fly cutter. An attachment by which a fly cutter can be mounted on a gear hobber has been designed and placed on the market by Schuchardt & Schütte, West Street Building, New York City. Fig. 1 is a view of the attachment in place on the firm's No. 4 standard gear hobber while Fig. 2 shows a closer view of the fly cutter operating on a 60-tooth blank having a pitch diameter of 28½ in.

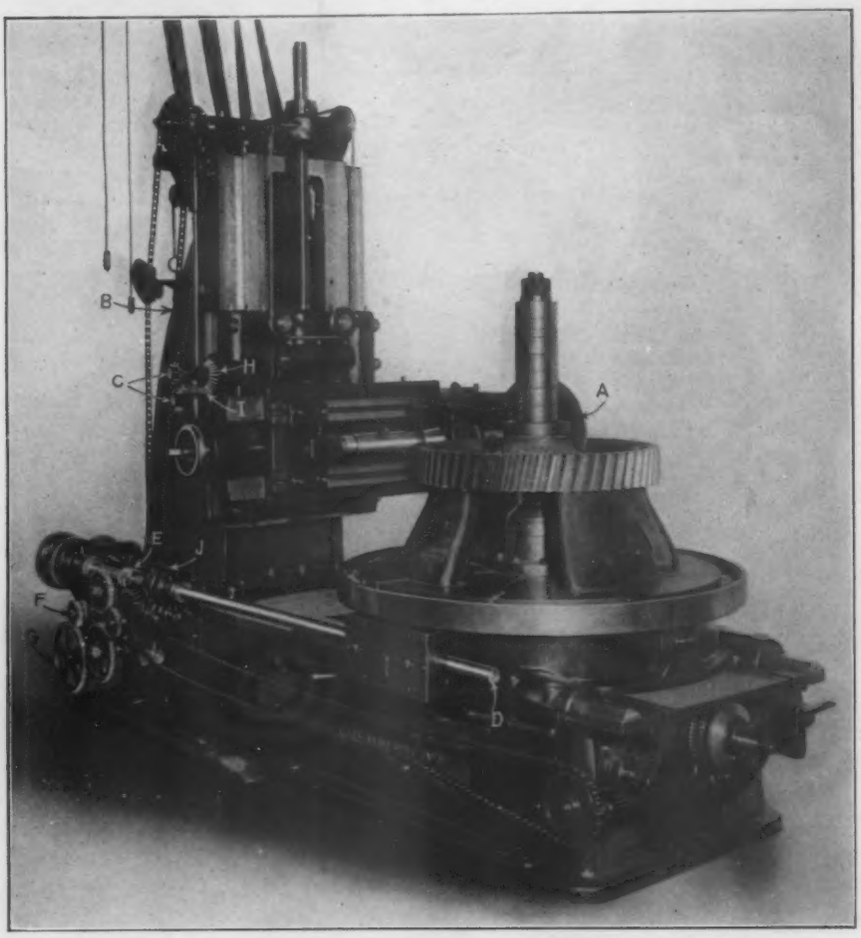


Fig. 1.—Cutting Worm Gears with a Fly Cutter on the No. 4 Standard Gear Hobber, Sold by Schuchardt & Schütte, New York City.

The attachment consists of a duplicate cutter head which is provided with cross feed and is designed to employ either a tapered hob or a fly cutter for generating the worm gear. The cutter arbor receives its power from a cone pulley on the back of the machine which drives a vertical shaft in the interior of the column through bevel gearing and a horizontal shaft through spur gears. This horizontal shaft drives the shaft D, Fig. 1, which revolves the table through the gears which are located to the left of the worm E. The feed mechanism which is not used in connection with the attachment is driven from the shaft D through the worm E which meshes with the worm wheel below it and through sprockets produces a movement of the horizontal chain. The gears F and G are used in connection with the attachment only and are driven through gears from the differential in the interior of the machine. This differential gear enables an attachment of this nature to be used and provides the necessary compensation for the motion of the hob or the fly cutter as whichever one is being used feeds past the gear blank. These gears are rocked in and out of position. Power for the cutter arbor is provided through a train of gears, one of which is shown at A that drives the hob mandril of the regular head. When this attachment is used the power for the cross feed is supplied by the chain B which controls the vertical feed for the regular cutter head. The only change made is to lengthen this chain so that it passes over the two idlers C. The cross movement of the cutter is controlled by the bevel gears H and I, the former receiving motion from the vertical chain B through a sprocket on its edge. If desired the cross feed can be controlled by hand. One of the special features of the gear hobber is the arrangement for taking up wear in the shaft D. This shaft is made in two sections, the division being at J. Each of the portions of the shaft has spur gears at the end, and these mesh with a spur idler underneath, the width of which is equal to the combined width of the two gears on the shaft. This arrangement enables the two portions of the shaft to be brought nearer each other to take up wear easily.

An example of the use of a fly cutter with this attachment is clearly illustrated in Fig. 2, which is a reproduction of a photograph taken at the plant of the A. B. See Elevator Company, Jersey City, N. J. The blank being operated on is a spiral worm gear which forms a part of the driving mechanism of the company's elevators and has a pitch diameter of 28½ in. and a face width of 4 in.. The 60 teeth of the blank are hobbed in the regular way and the fly cutter is then used to generate the worm path in the sides of the teeth. This path consists of an approximately semi-circular groove in the sides of the teeth and eliminates play between the two gears. This cutter is made in two parts so as to generate the path on the side of two adjacent teeth simultaneously. The use of the fly cutter for this kind of work was suggested by Niles E. Lindstrom, works manager for A. B. See Elevator Company, when it was not possible to secure the necessary hobs on account of labor troubles. This method of generating the worm path enables a blank of the size shown to be completely finished in 14 hr., the time being divided equally between the hobbing of the spiral gear and the generating of the worm path.

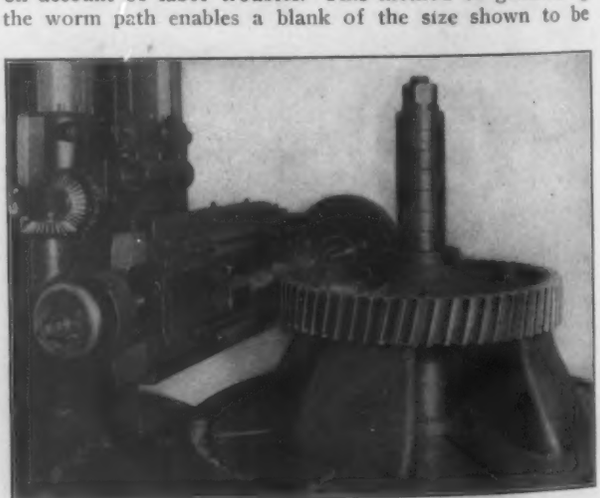


Fig. 2.—View of the Cutter and the Blank.

Chilled Rolls with Passes Cast In

A patent has recently been granted Alfred I. Crook and assigned to the Philadelphia Roll & Machine Company, Philadelphia, Pa., covering a new method of making chilled rolls with passes cast in. The patent covers a

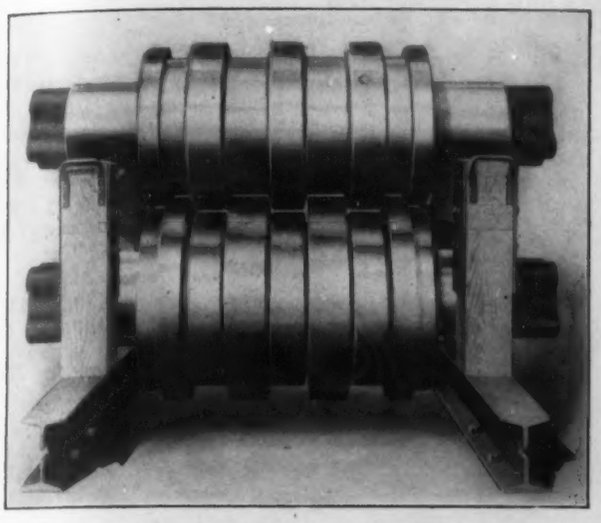


Fig. 1.—Chilled Rolls Made by Philadelphia Roll & Machine Company, Philadelphia, Pa.

radical departure from prevailing practice, but as a large number of rolls have been produced by this method in the year it has been in use by this company, it is felt that its value has been thoroughly demonstrated and it can no longer be considered an experiment.

Some of these rolls are shown in Figs. 1 and 2, while the necessary apparatus is shown in Figs. 3 and 4. Fig.

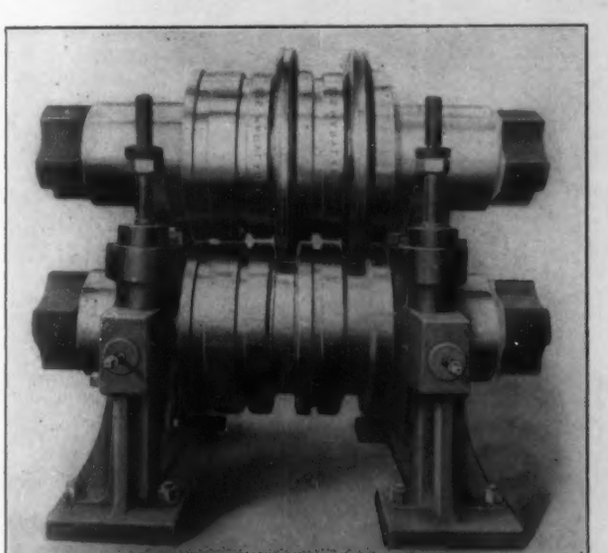


Fig. 2.—Chilled Rolls Made by Philadelphia Roll & Machine Company, Philadelphia, Pa.

3 shows the apparatus used in this method before assembling and shows the separate rings for each pass and the main chill-shell with the upper portion of the mold rammed in it, also the drag lying on its side. Fig. 4 shows the same mold with drag ready to receive the chill and the rings assembled and secured within the main shell.

It is understood that practically all the chilled-pass rolls made previously either have been made by inserting a chill-ring within an ordinary sand mold or have been made in chill molds split or parted vertically to allow their removal from the roll after cooling. The new method in the first place is regarded as ensuring sufficient chill by the fact that temptation to use light chill-rings is avoided and by the fact that the sand with the light rings, being a poor conductor of heat, tends to destroy the desired chilling effect. In the second place the new method does not carry with it the annoyance of the tendency of a

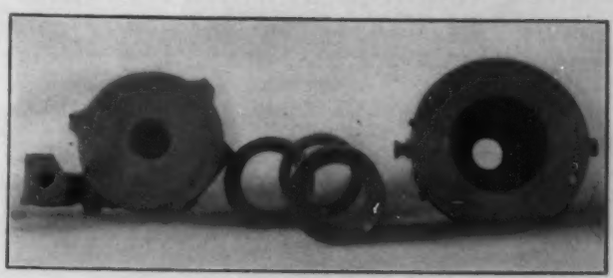


Fig. 3.—Apparatus before Assembling, Showing Rings for Each Pass and Main Chill Shell.

roll to develop a crack longitudinally along the line of parting.

Chill-rings of suitable shape and composition are fitted and temporarily secured within a solid outside shell of a form easily removed intact from the roll after cooling. These rings, which form the passes, are released shortly after the roll is poured and are thus free to change their position within the shell, thereby avoiding all undue resistance to the natural contraction of the cooling metal

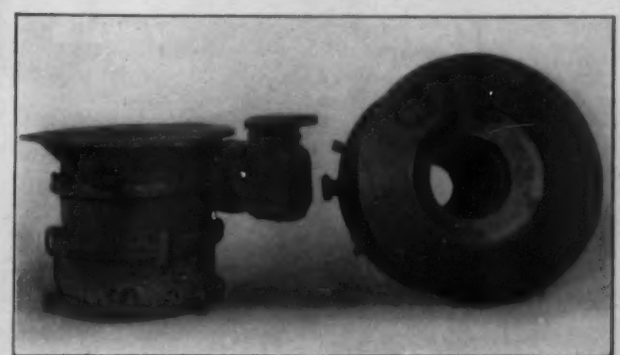


Fig. 4.—The Mold with the Drag Ready for Chilling and the Rings Assembled.

within. This works to prevent internal stresses due to the casting of an irregular body with an unyielding mold. The chill-rings being uniformily in contact with the solid chill-shell, which is heavy and an excellent conductor of heat, it is possible, it is found, to obtain the desired amount of chill upon the passes of the rolls.

Automatic Welding of Hoops by Toledo Welder

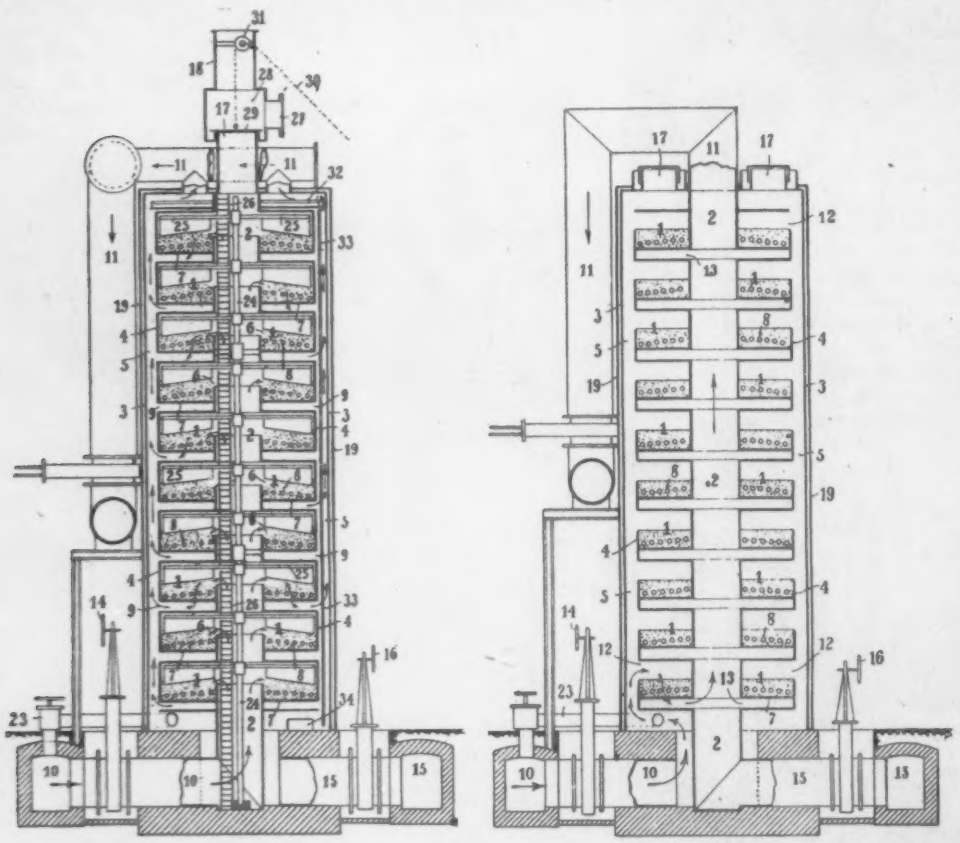
The Toledo Electric Welder Company, Cincinnati, Ohio, has brought out an automatic welding machine for welding hoops, buckles and other articles turned out in large quantities. The machine makes 15 to 30 welds per minute, according to the kind and size of stock that is used. In making hoops of No. 5 wire, a boy places the wire hoop in the jaws of the welder which automatically closes on the wire and turns on the current; the jaws are forced together to complete the weld; the stock is released, and the machine set ready to make the next weld. As soon as the weld is made the boy throws the hoop to one side and immediately places another hoop in the jaws of the welder. The welds are alike, each having the same amount of upset. The machine is belt driven, requiring about ½ hp. to operate. The dimensions of the machine are 20 x 24 in.; total height 48 in.

Pratt Institute Exhibition.—The annual exhibition of the students of Pratt Institute, Brooklyn, N. Y., will be held June 1, 2 and 3. This institute is one of the pioneers in the field of industrial education in the United States, and offers a wide range of courses in mechanical, scientific, artistic and domestic subjects. In the school of science and technology, which is the division of the institute especially concerned with the training of young men in industrial and technical lines, the various classes will be at work in the shops and laboratories during the exhibit and thus an excellent opportunity will be given those interested to inspect not only the results of the students' work, but also the methods of instruction and the general facilities for conducting this kind of training.

Calcium Chloride for Drying the Blast

Installation at the Differdange Steel Works, Luxemburg—Emphasis on Low Cost as Compared with Refrigerating Method—The Calcium Chloride Successively Hydrated and Regenerated

The general features of construction and the experiences of operation of a process for the desiccation of air for the blast furnace by the use of calcium chloride are obtained from an installation for a 150-ton blast furnace at the Differdange steel works at Luxemburg, Germany. The plant is especially interesting for the scheme of regenerating the calcium chloride after every period of its useful work in extracting the water vapor in the air, and the large scale of the work and the promising commercial aspect of the process make it an important development in blast furnace practice. The theory of the use of calcium chloride as a desiccating agent; a sketch of different attempts to use it on a large scale for industrial operations, and an account of the Differdange plant were given in a paper presented before the meeting of the Iron and Steel Institute in London, May 10 and 11, by Felix A. Daubinè and Eugène V. Roy, Auboue, France, and from this paper has been obtained the following information.



Figs. 1 & 2.—Vertical Sections of the Two Types of Drying Apparatus Using Calcium Chloride.

Details of the Process

The details of the process are: A layer of broken calcium chloride, the smaller pieces at the bottom and the larger pieces at the top, rests on a sieve. Within the mass of the calcium chloride, and in its lower part, is submerged a spiral grating, consisting of pipes for the circulation of water. The volume of air to be dried is made to traverse the mass of calcium chloride from top to bottom, the draught being created by a fan. The absorption of the water by the calcium chloride leads to an evolution of heat, and this heat is carried away contemporaneously with its production by the water circulating within the spiral. Without this indispensable precaution the temperature of the mass of calcium chloride would rise, and the chloride mass would cease to act efficiently.

The hydration of the calcium chloride should be arrested when the outside pellicle of the broken pieces commences to liquate. If it were continued, the mass of the calcium chloride would be completely melted, and it would be impossible to regenerate it on the spot. Further, the fact of its being liquefied indicates that the calcium chloride has formed a hydrate whose dilution is already very considerable, which dilution renders it unfit for effective desiccation.

At this point it becomes time to regenerate. During the progress of this regeneration it is necessary gradually to raise the temperature in such a manner as constantly to maintain the hydrates in their solid phase. Suppose, for example, that, after the passage of the air to be dried, the exterior hydrate is, at a given moment, one molecule of calcium chloride to four of water, a hydrate which melts at about 40 deg. (104 deg. F.) Owing to the circulation of the water, which has maintained the temperature of 15 deg. (59 deg. F.), this hydrate has remained solid; if, at the moment of regeneration, the temperature be suddenly raised to above 40 deg., the pellicle corresponding to the above formula melts, breaks down and is wasted. It is necessary, therefore, to proceed progressively, according to a law which has been recognized in practice, and may be deduced in theory, from the curve of the liquid and solid phases of the different hydrates of calcium chloride.*

It is necessary also, in the course of this regeneration, to be careful not to exceed the temperature of 235 deg. (455 deg. F.), above which the "tardy" hydrate, one molecule of calcium chloride and one of water (slow in dessication) is formed. It is thus possible to effect the regeneration of the calcium chloride with sources of heat of comparatively low grade, and thus it is possible to employ, with this object, the waste fumes which occur plentifully in all metallurgical works.

The regeneration of the calcium chloride having been effected by this systematic warming, it is necessary, in order to render it again fit for the complete absorption of water vapor, to cool it completely. This cooling is quickly attained by a rapid circulation of water in the pipe system. When the temperature has returned to that of the average environment, the chloride of calcium has regained all its hygroscopic properties and is capable of desiccating afresh the new volumes of air.

Actual Plant and Its Operations

The problem was to desiccate the whole of the air required for the blowing of a blast furnace of 150 tons per twenty-four hours, in order to realize at this blast furnace the economies described by Mr. Gayley in his experiments of 1904, and in those he has undertaken since.

*Bulletin de la Société de l'Industrie Minerale, December, 1909, p. 497.

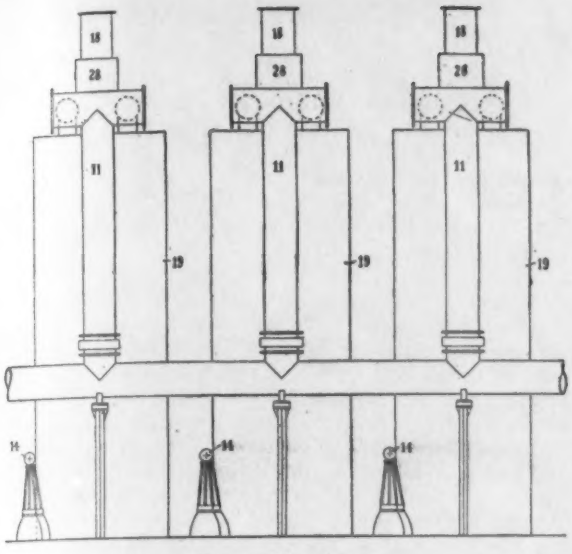


Fig. 3.—Elevation.

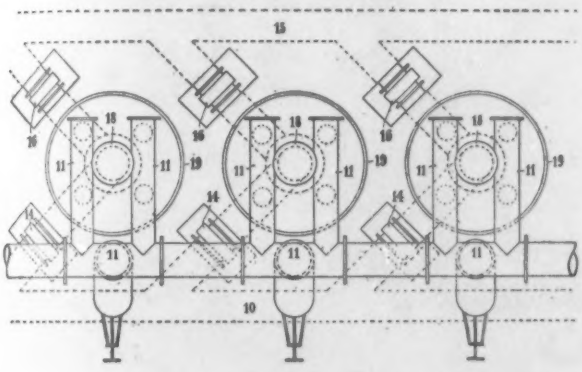


Fig. 4.—Plan.
Apparatus for Air Drying by Calcium Chloride.

The appliances at the Differdange Works were designed by the firm of Paul Wurth & Co., Luxemburg.

Drawings showing two forms of apparatus are given. In the first design the blast is introduced by a central well, and distributed in layers by means of the openings leading to different superposed reservoirs. On emerging from the latter it is collected in an annular chamber, whence it is led to the place where it is to be utilized. In a second form of appliance, on the contrary, the blast arrives by way of the annular chamber, and is collected in the central well after traversing the layers of chloride of calcium, and is led thence to the place of utilization.

In order to be able to regenerate the chloride of calcium on the spot, the central well (or the annular chamber) is connected with a second pipe, admitting air or hot gases. The arrangement of the fans is such that it is possible, at will, either to pass the air to be dried, or the gases which are to serve for the regeneration, through the apparatus, or else to isolate it completely during the cooling down.

Fig. 1 shows, diagrammatically and in longitudinal section, the first type of design, and Fig. 2 the second type. Figs. 3 and 4 show in elevation and in plan an installation composed of several drying apparatus; while Figs. 5 and 6 show, in longitudinal section and in plan, the details of the spiral cooling arrangement. According to Figs. 1 and 2, the apparatus, which has a cylindrical shape, is composed of a certain number of compartments identical with each other (1), a central shaft (2), a cover (3), which forms, with the external shell (4), a number of compartments, and the annular chamber (5).

Each compartment (1) has a circular inlet orifice (6) and a grid (7), on which the chloride of calcium rests. An outlet (9) is provided below the grid. Toward the end of the desiccation the air is drawn by means of the fan across the main lead (10) into the central shaft (2), and distributed to all the compartments. It traverses the chloride of calcium from above downward, depositing its moisture; it then escapes into the annular chamber and reaches the conduit pipe (11), which takes it to the place of utilization.

As is well known, the chloride of calcium warms during the desiccation, and this must be rectified by the cooling. It is with this object that water is made to circulate in the spirals provided in each compartment. These spirals are arranged to have a certain inclination to provide for their being rapidly emptied. The joints are effected in a special box securing a water-tight separation for the chloride of calcium, with a discharge vent in case the joint becomes defective. The chloride is thus completely protected against such an event occurring.

When the chloride of calcium has absorbed the requisite amount of moisture, the apparatus is cut off from the inlet and outlet of air by the gate valve (14), and communication is made by means of the gate valve (16) with the main (15), which conducts air or warm gases. As the temperature should only be increased gradually, the fan aspirates cold air at the same time as it takes in the gases, to allow of the temperature being regulated. By diminishing the amount of air admitted, and increasing that of the gas, the temperature is gradually raised to 235 deg. (455 deg. F.)

When the calcium chloride has been regenerated, the apparatus is first cooled by means of a cold current of air entering the chamber (5) by the conduit pipe (23), and escaping by the outlet orifice (17), and then water is introduced in the spiral cooling coil until the temperature has been sufficiently lowered. The apparatus is then ready to desiccate the air-blast anew.

In the installation shown in Figs. 3 and 4 and in the half-tone engraving, three apparatus have been assumed to be employed, of which one dries the blast, while in the second the chloride of calcium is being regenerated and the third is undergoing cooling. During the period of the passage of the blast, or at the end of the period of cooling, it is possible to obtain access to the appliance, either by the central shaft by means of the ladder shown in Fig. 1, or to the annular chamber by the ladder (33) running on rails at the top of (32).

In the application of the process at Differdange, which is shown in the half-tone, the conditions required the drying of 30,000 cu. m. (1,060,000 cu. ft.) of air hourly. The apparatus constructed in accordance with the plans possesses the following features:

Total area presented to the passage of the blast, 100 sq. m. (1075 sq. ft.) per apparatus.
Number of compartments, 10.
Depth of the layer of calcium chloride in each compartment, 24 cm. (9.5 in.)
Apparent density of the chloride of calcium, 1.0.
Weight of chloride of calcium contained in each apparatus, 24,000 kg. (52,900 lb.)
Weight of chloride of calcium contained in all three appliances, 72,000 kg. (158,700 lb.)
Cooling surface of the spirals in each apparatus, 170 sq. m. (1830 sq. ft.)

Results of Calcium Chloride Drying

These appliances have been designed to work in the most unfavorable conditions—that is to say, to remove, during the summer months, 15 g. of moisture per cubic metre of air during a period of four hours (6.5 gr. per cubic foot).

At the time of writing this paper the appliances have been working normally for six weeks; but as the season is the end of winter, and as the moisture in the air is not very large, it has been found unnecessary to make as many reversals as were contemplated. Each apparatus receives the blast for 6 to 8 hours. The air, which contains 6 to 8 g. of moisture (2.6 to 3.5 gr. per cubic foot) before its passage, only contains from 1 to 1.5 g. per cubic metre (0.45 to 0.65 per cubic foot) on emerging from the apparatus, and this figure remains practically constant from the commencement to the conclusion of the period.

Regeneration requires four hours for its completion, and is carried out by means of the waste smoke gases from boilers and from Cowper stoves. These gases, cleaned to the extent of 0.4 g. per cubic metre, pass directly through the mass of chloride. The temperature is regulated at 30 deg. (85 deg. F.) to commence with, and thereafter gradually raised in conformity with a certain ascertained law up to about 200 deg. (400 deg. F.) In the summer the temperature will be carried to 275 deg. (525 deg. F.) Cooling takes three hours.

To compare the system with air drying by the refrigeration process, it is explained substantially that to secure a resultant condition of only 0.65 gr. of water vapor per cubic foot or air, as is accomplished with calcium chloride regeneration and cooling carried only to about 60 deg., it

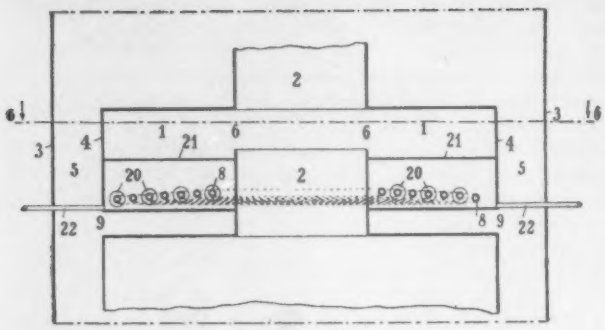


Fig. 5.—Sectional Elevation.

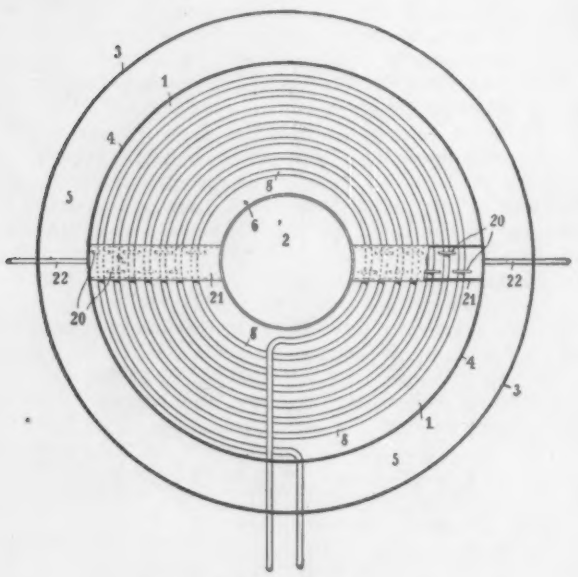


Fig. 6.—Plan.
Spiral Cooling Coils in Trays of Calcium Chloride.

is necessary in refrigeration to cool the air as low as to 6 or 7 deg. F. In fact, the authors state that refrigeration, cooling to, say, 23 deg. F. leaves a minimum of 18.2 gr. per pound of dry air, while the use of the calcium chloride, regenerated under the form of one molecule of the chloride to one or two molecules of water, and maintained in sufficient excess at 60 deg. F., allows of a degree of moisture as low as 3.5 gr. per pound of dry air.

During the winter months, during which the refrigerating system is practically inoperative, particularly in Continental localities, chloride of calcium allows of exceedingly low figures being attained—that is, distinctly less than 1 g. per cubic metre of air (0.45 gr. per cubic foot). The installation is too recent for the true value of the economies realized to be stated, but it is now quite established that the manufacture of dry air need present no difficulty whatever.

The installation cost a little less than one-quarter of what would have been the cost of an installation for desiccation by means of refrigerating machines. One man for the day shift and one for the night shift are sufficient to handle the apparatus, which is of the most simple description. The expenses of working are thus greatly reduced.

The authors state, in conclusion, that similar apparatus are under investigation, not only for other metallurgical works, but also with a view to their application in other industries that require drying operations carried out at low temperatures, as, for example, for the desiccation of chemical or pharmaceutical products, india rubber, resins, gums, gelatine, albumen, glue, aniline colors and various organic bodies.

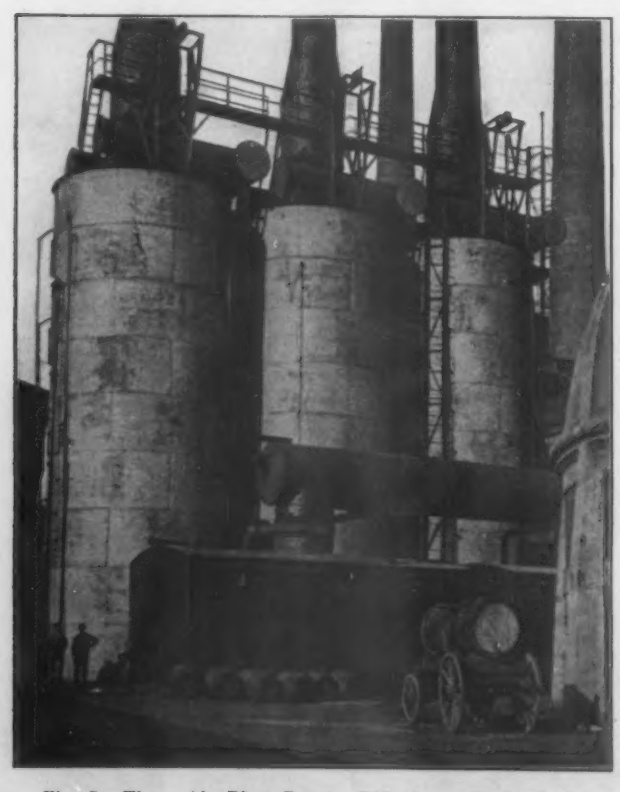


Fig. 7.—Three Air Blast Dryers, Differdange Steel Works, Luxemburg.

The Sherman Anti-Trust Law Muddle

The following analysis of the situation in which large combinations are placed, as a result of the recent Supreme Court decision in the Standard Oil case, is taken from a statement by the eminent lawyer, James M. Beck:

The Sherman law is not a code of ethics, but the formulation of an economic policy. This policy, whatever it is, cannot be impartially administered by regarding the so-called good trusts with immunity and denying the so-called bad trusts equal rights in combining their energies and resources. The decision just announced necessarily gives a fruitful opportunity for executive caprice and political tyranny, for primarily the executive must determine the sweet reasonableness of each combination, and the hand of arbitrary power is thus placed at the throat of business.

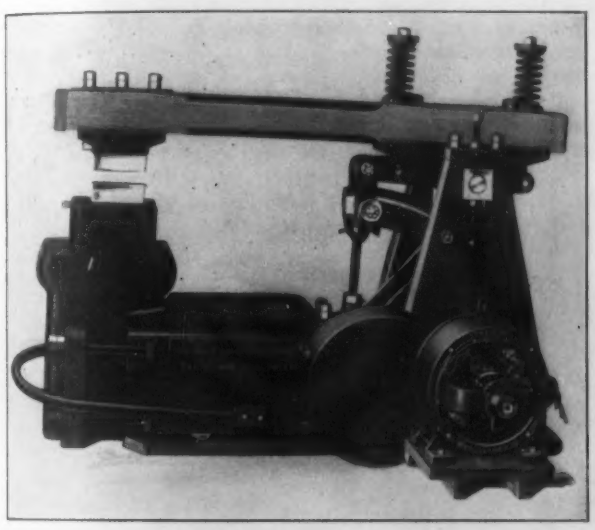
Fortunately for a few years we will have a high-minded executive, who will not willingly abuse such power. But after him, will it be the deluge? In a case decided in 1888, the late Justice Brewer held that if a law made it an offense for a railroad to charge an "unreasonable rate," it would be void for want of certainty, "for no penal law can be sustained unless its mandates are so clearly expressed that any ordinary person can determine in advance what he may and what he may not do under it." He likened such a statute to a section of the Chinese penal code, which punished any one who was guilty of "improper conduct." Under the Sherman anti-trust law, as now interpreted, capital may not be combined to engage in interstate commerce unless the incidental restraint of trade is "reasonable," but is there a living man, whether lawyer or layman, judge or prosecuting officer, who is now able to state under what circumstances the co-operation of capital is "reasonable"? Let us fervently hope that in the American Tobacco case the dead line of the law, which separates the permitted from the inhibited, may be clearly defined, for what the American business man needs is certainty.

Is there not a tendency in this country to confuse realities with word symbols? We use expressions like "restraint of trade" and "reasonable" much as the collector in Nicholas Nickleby spoke of the "unities of the drama," but exactly what the phrases mean no one can explain. To me the situation promises little but further forensic controversy and political agitation. The legal profession will, doubtless, flourish and the engraving companies, which print certificates of stock, will, likewise, work overtime, but will the business interests of the country, after a temporary flourish of enthusiasm, really make much progress through this legal morass? In the meantime Germany and England, in fostering the unification of capital and facilitating economic agencies, are more flourishing than in years, while our nation, with its unequalled natural resources and its energetic and ambitious workers, is floundering in a quagmire of obscure legal phrases.

New Welch Hammer of the Helve Type

A new variable-blow power hammer of the helve type has recently been brought out by the Welch Hammer & Machine Company, 1523 Williamson Building, Cleveland, Ohio, and is shown in the accompanying illustration. It is designed for all kinds of forging work. The cut shows the motor-driven machine, and it is claimed that it is the only power hammer on the market that can be motor driven by a direct-connected motor. The belt-driven machine also made is, it is explained, the only hammer running with a tight belt..

The hammer is simple in construction. Its distinctive feature is the method of transmitting the motion of the eccentric to the helve through the link mechanism by means of which the force of the blow is regulated by the operator. A swinging bracket, which supports and pivots one end of the link segment, is balanced on bronze bushings, which also form the main bearings of the driving shaft. This bracket is connected by means of two short links to the foot treadle. A hardened bearing block, accurately fitted to the slot in the link segment, has its end bearings in the U links, pendant from the beam



Helve Type Hammer with Directly Connected Motor, Built by the Welch Hammer & Machine Company, Cleveland, Ohio.

lever. The short ends of the U links are connected by means of straight links to points in the housings directly in line with the pivot point of the link segment at full stroke.

The pivot pin or dead center of the link segment comes up in the U links in alignment with the center of the sliding block in the segment. The free end of the segment is oscillated by means of an eccentric on the driving shaft and when on dead center no motion is transmitted to the helve.

The foot treadle furnishes the means of stopping, starting and controlling the machine, the throw of the helve and force of the blow being regulated by the amount of pressure applied to the treadle. A slight pressure of the treadle shifts the position of the link with relation to the sliding block and the motion of the link is transmitted to the helve. The stroke or throw of the helve can, therefore, be varied by the operator from an absolutely dead position to the full stroke. The machine runs at a constant speed of about 300 r.p.m. One of the points of excellence claimed for it is its ability to strike light finishing blows at high speed, which is desired on a large class of work.

A balancing mechanism is located between the housings and works to balance the swinging bracket and remove the weight of the helve from the links. The helve is balanced on a pivot shaft and beam lever by means of soil springs on top of the helve. The point is made that as a result the helve vibrates like a spring and strikes a sharp and snappy blow. It is claimed that the machine can work satisfactorily on bars up to 2¼ in. diameter.

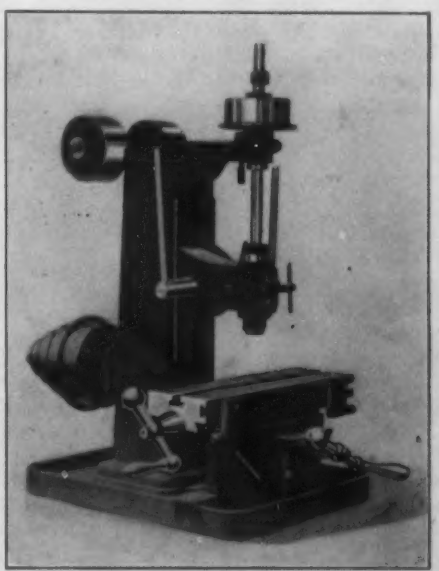
In the picture the machine is shown with the link segment shifted to the position of full stroke. The wheel for the belt drive and the motor and gearing for the motor drive can be applied to either side of the machine and the motor drive can be applied to all sizes and styles of these hammers.

The anvil weighs 1500 lb., or 25 times the weight of the hammer head. The complete machine weighs about 5000 lb. The hammer head is made of cast steel and the dies are tool steel. The links and other small parts subject to shock or stress are steel castings or forgings. The helve is made of seasoned hickory. The floor dimensions of the belt-driven machine is 40 in. x 6 ft. 6 in. and the dimensions of the motor-driven machine are 56 in. x 6 ft. 6 in. The machine is to be made in standard sizes. The company, it is understood, will also make power hammers with guided heads adapted for various classes of work.

Vertical Combination Bench Miller and Drill

A combination vertical bench milling and drilling machine has been built by R. M. Clough, Tolland, Conn. This new tool has a capacity for drilling holes up to a maximum diameter of ½ in. and is intended to be used with ½-in. mills, although larger ones can be used for taking light cuts and heavier cuts can be taken by employing mills of smaller diameter.

The table has a working surface of 16 x 5⅛ in. and there is a ⅝-in. T-slot through the center. A longitudinal movement of 10 in. and a transverse one of half that extent are provided and the feed screws have micrometer indexes reading in thousandths of an inch and adjustable stop gauges enable the feed to be disengaged at any desired point. The spindle has taper bearings with adjusting nuts for taking up the wear and at the lower end



A Vertical Bench Milling and Drilling Machine Made by R. M. Clough, Tolland, Conn.

there is a No. 7 Brown & Sharpe taper hole. The spindle sleeve has a movement of 4 in. and is operated by a rack and pinion. The lever at the right of the head clamps the spindle in position for milling, while the one at the left controls the 8-in. adjustment of the sliding head on the column.

The machine is driven by a 2-in. belt, the power being secured from a 5-in pulley on the countershaft and transmitted to a three-step cone pulley on the machine. The weight of the machine including a plane or a swivel vise is 300 lb.

With every nation on earth represented for the first time since its establishment in 1883, the International Union for the Protection of Industrial Property began its fourth conference at Washington, D. C., May 15, to consider many new industrial problems, which have arisen either directly or indirectly from patent and trademark laws. The conference is expected to negotiate many treaties affecting various industrial problems. All of the proceedings are conducted in French and are secret. Delegates to the meeting have plenary powers to draft and sign treaties and agreements in the names of the countries they represent. In nearly every instance the chairman of a delegation is the highest diplomatic officer of his country now in the United States.

Molding Machine with Stripping Plate

Pridmore Rock-over Machine Having Also Universal Flask Rest

A rock-over molding machine possessing the interesting feature of being equipped with a stripping plate attachment has been developed by the firm of Henry E. Pridmore, Nineteenth and Rockwell streets, Chicago, Ill.

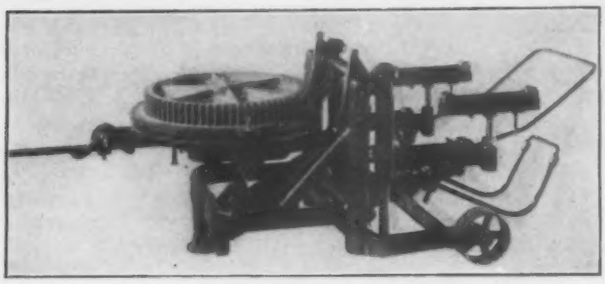


Fig. 1.—Rock-over Molding Machine Built by Henry E. Pridmore, Chicago, Ill.

It is believed this is the first rock-over machine of this type and consequently marks a departure in molding-machine practice. The addition of the stripping plate attachment works to increase greatly the output of the foundry, gaining an efficiency not possible with the rock-over machine in itself or with the stripping-plate machine in itself. The machine is also provided with the Pridmore patented universal self-adjusting flask rest, designed to receive bottom boards of all irregular shapes.

The illustration shows one of the Pridmore standard

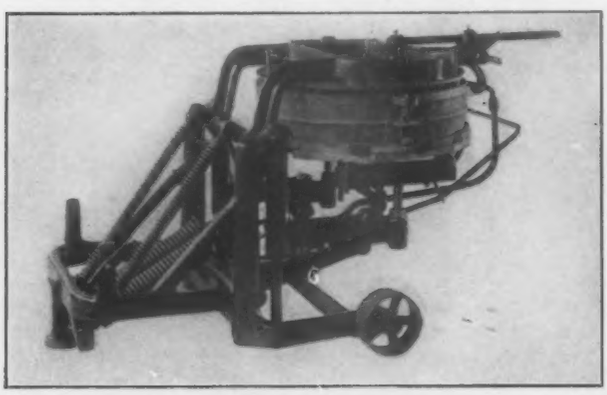


Fig. 2.—Pridmore Molding Machine with Flask Rolled Over Ready to Draw Mold.

29 x 24-in. rock-over machines with 8-in. draw. It is mounted with a gear pattern 25 in. in diameter and 3 in. in face dimension. In Fig. 1 the machine and pattern are ready to receive the flask. In Fig. 2 the flask has been rammed up and rolled over ready to have the pattern withdrawn. The mold is then lowered and the

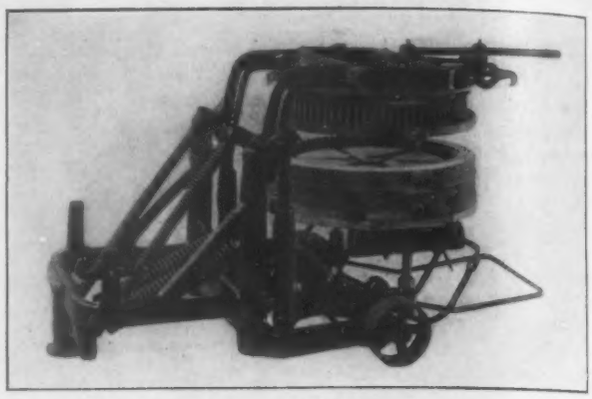


Fig. 3.—The Draw Completed with Stripping Plate Hanging.

stripping plate remains in place doing its work until the draw is completed, as shown in Fig. 3 with the stripping plate hanging. The pattern and stripping plate are then rolled over to the receiving position and the next mold is made.

Attention may be called to the flask rest which is locked in position by pulling the lever which hangs conveniently under the rest. It is explained that the flask rest is dust and sandproof, and has no loose parts to get out of order. Finally it will be noted that there are no gears on the stripping-plate attachment likely to require the rolling over of the machine and flask clamped together. In making gear molds a saving of 25 per cent. in time over the old stripping-plate method is claimed.

The Baker Hammer Flue Cleaner

New Device for Removing Scale from Boiler Tubes

Under a patent recently granted, William J. Baker, 100 West Cayuga street, Oswego, N. Y., is manufacturing a new type of flue cleaner. The principal feature of the cleaner is the use of a tubular frame containing a lever hammer which gives the device its name. Fig. 1 is an elevation and a longitudinal section of the cleaner and Fig. 2 shows it being operated by compressed air, although, if desired hand operation can be resorted to.

The cleaner consists of a tubular frame with an elongated opening, *a*, in one side for receiving and permitting the operation of the hammer lever *b*. This lever is pivoted midway between its ends to opposite sides of the opening and at one end has a hammer head, *c*, and at its opposite end a bearing face, *d*, for engagement with the member *e* which furnishes the rotary motion. A laminated spring, *f*, keeps the hammer end of the lever pressed radially outward while the other end is pressed against the face of the actuating member *e*. The spring consists of a series of flat leaves secured together at one end and to one side of the tubular frame by screws or bolts.

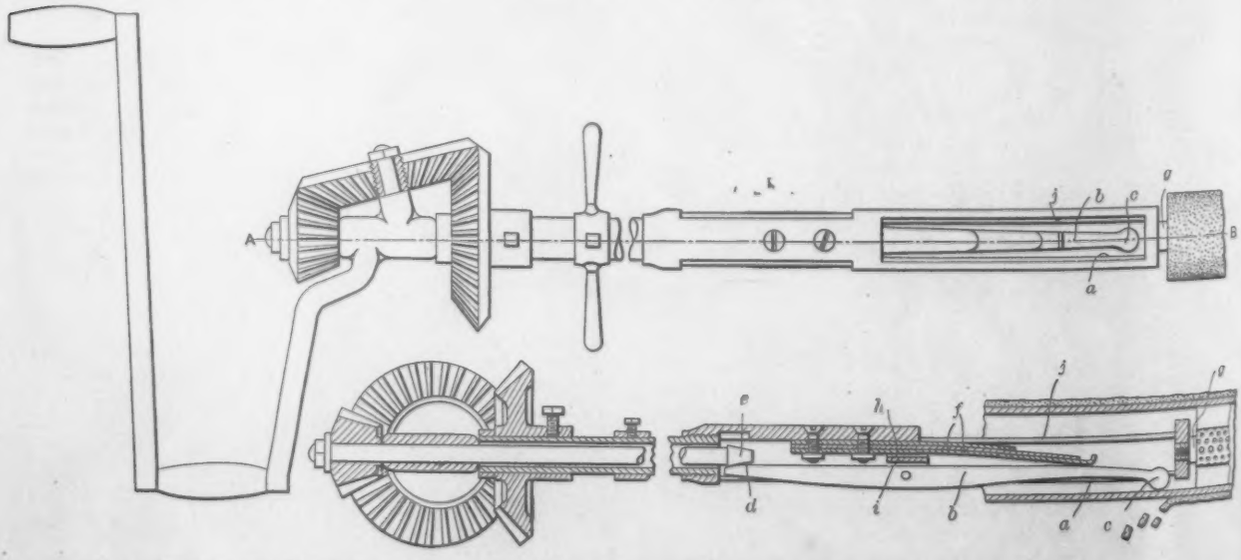


Fig. 1.—Elevation and Longitudinal Section of the Baker Hammer Flue Cleaner Made by W. J. Baker, Oswego, N. Y.

The frame has opposite end heads which as the name indicates are located at opposite ends of the slot. Both heads are internally threaded. The threaded end of a tubular extension of the frame is screwed into the head at the left while the threaded opening in the head at the opposite end is arranged to receive the threaded end of a brush frame *g*. This frame carries a brush which is used for cleaning the interior of the flues at the same time that the operation of the hammer which removes the scale from their exterior. The object of using this brush is to clear away the soot and other matter from the interior of the tube in advance of the hammer head so that the latter may strike directly against the metal. In this way the action of the latter is rendered more effective in removing the scale from the outer surface of the flue since the accummulations of soot or other material on the flue which might act as a cushion for the hammer and prevent the removal of the scale without repeating the operation a number of times at the same point are removed.

The hammer lever has practically the same length as that of the slot in which it plays and is located between the end heads. The hammer head travels in close proximity to the advance end head so that when the tubular frame is placed in the flue, one or both of its end heads can rest against the interior of the tube when the hammer is drawn back preparatory to striking a blow against the inner face of the flue. This arrangement renders the operation of the hammer more effective than would be the case if it were allowed to rest against the wall of the flue when drawn back to its extreme position against the action of the spring *f*. The pressure of this spring is applied to the inner edge of the hammer lever between the point at which it is pivoted and the hammer head *c*, the preferred

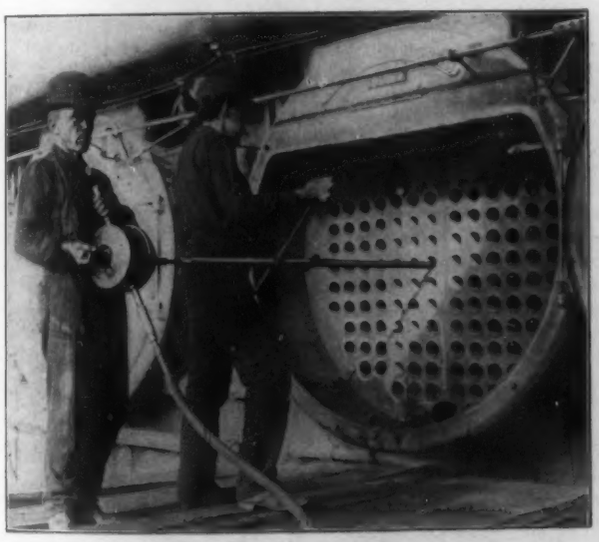


Fig. 2.—The Cleaner Being Operated by Compressed Air.

point being near the hammer head so that as much force as possible can be exerted in driving the hammer to its striking position. The opposite end of the spring is secured to the frame behind the point at which the lever is pivoted, thus giving considerable elasticity to the free end of the spring. The parts of the spring immediately in front of the fastening bolts are passed through and guided in a lengthwise slot, *h*, in a transverse partition, *i*, of the tubular frame. This partition extends between the inner face of the spring and the adjacent edge of the lever near the point at which the latter is pivoted to stiffen the sides of the frame and at the same time to relieve the fastening bolts from excessive strain and afford a means for restraining the spring against undue lateral movement. The front portion of one side of the frame diametrically opposite to the opening, has a lengthwise opening, *j*, extending from the advance end head to a point near that at which the lever is pivoted and permitting the lever play at the free end of the spring when the hammer end of the lever is drawn back and the spring retracted.

The tubular extension of the frame which is shown at the left of Fig. 1 can be made of any desired length, the preferred form being a common metal pipe with one or more pieces according to the length of the flue to be cleaned. The actuating member *e* is made in the form of a double cam which forms part of a rotatable shaft extending through the tubular extension for its entire length. The position of this actuating member and the way in which it makes contact with the bearing face of the adjacent end of the hammer lever *b* is clearly shown in the lower portion of Fig. 1. The power for operating the cleaner by hand is provided by the crank handle at the left of the upper view of Fig. 1 and is transmitted through the system of bevel gearing shown to the actuating member *e*. For operation by compressed air as shown in Fig. 2 the tubular extension of the frame is removed and an air motor attached.

After the boiler is blown off the manhole plate and the front hand hole plate are taken out to dry the tubes thoroughly. After the inside of the tube has been brushed out the machine is inserted in a tube so that the hammer is within ¾ in. of the back head and the guard shown in Fig. 2 fastened on the front of the boiler. The handle and the hammer tube are then turned through two or three complete revolutions and the machine drawn out about 3 in. The hammer is then rotated two or three times and the process repeated until the entire length of the tube has been covered.

Seven sizes of cleaner ranging from 2½ to 6 in. in diameter are made. When hand operation is used an ordinary boiler can be cleaned in nine hours, while when compressed air is used this time is reduced very considerably. In both cases two men are reduced, one for the cleaner and one for the guard.

The Standard Screw Company

The Standard Screw Company, manufacturer of machine screws, has issued its report for the year ended March 31, 1911, which compares as follows with the previous year:

	1910-11.	1909-10.
Net income (after all deductions for expenses and depreciation)	$375,927	$454,554
Interest charges	31,324	74,172
Balance available for dividends	$344,603	$380,382
Dividends	270,000	269,814
Year's surplus	$74,603	$110,568

The general balance sheet as of March 31, 1911, shows assets as follows: Plant and equipment, $5,067,970; stock in treasury, $64,986; interest, etc., paid in advance, $11,588; product, materials and supplies, $869,043; accounts and notes receivable, $393,833; cash, $136,845; total, $6,544,265. Liabilities: Preferred stock, $2,000,000; common stock, $2,500,000; bonds, $600,000; notes payable, $386,000; accounts payable, $151,895; profit and loss surplus, $906,370; total, $6,544,265.

President W. B. Pearson says: "Building operations at Hartford, Detroit and Chicago are completed. A considerable lot of new machinery is installed in the new space, and much of the old machinery has been rearranged, with the result that we are showing greater efficiency than ever in our production."

At the annual meeting of the company W. E. Cooper was elected a director to succeed E. D. Dolliver, deceased. S. W. Kelley was elected treasurer to succeed Mr. Dolliver.

The Builders' Supply Corporation, Indianapolis, Ind., has been caused considerable annoyance by a statement recently published in *The Iron Age* that the Builders' Supply Company had changed its name to the Capital Builders' Supply Company. This has no reference to the Builders' Supply Corporation, which has not changed its name, but continues to conduct its business as jobber and retailer of hardware, mantels and general builders' supplies at 342 East Washington street and 335 East Court street. A. F. Kleinschmidt is president and George C. Pattison is secretary and treasurer.

The Engineers' Appliance Company, Cleveland, has been incorporated with a capital stock of $20,000, to manufacture the Hydromatic water valve recently placed on the market by the Cleveland Steel Tool Company, and which was described in *The Iron Age* of May 18. The organization of the company will be practically the same as that of the Cleveland Steel Tool Company, and for the present the valves will be made at the plant of the latter company.

Welfare Work

Its Tendencies and Potential Results

BY MAX H. C. BROMBACHER.*

Of the many excellent papers read at recent trade gatherings and reprinted by *The Iron Age,* none seemed to the writer so interesting as well as important as the paper† read by W. A. Grieves, employment superintendent of the Jeffrey Mfg. Company, Columbus, Ohio, on the subject of "Mutuality." The deep impression made by this paper was due, in the main, to three reasons, one of which was the interesting contents and data contained in it; another was the tendencies which the paper indicated are commencing to obtain a foothold among owners of industrial concerns in respect of treatment of employees; and the third was the inherent significance of these tendencies and the ultimate result of their growth.

In the second paragraph of his paper Mr. Grieves shows that he has a fundamental grasp of his subject when he says, in effect, that we must revert to first principles by working from cause to effect, instead of from effect to cause in the matter of labor troubles; that we have been directing our efforts toward combating undesirable influences and conditions for which we have been to some extent responsible; that we should have been and should be working for the prevention of these undesirable influences and conditions. In his concluding paragraph he shows that the element of personal sympathy and humanity, of sentiment, is a necessary factor in the successful treatment of the matter in hand. If and when the average manufacturer becomes inoculated with the beneficial virus of these basic ideas or principles, then, indeed, will our industrial situation have made a vast step forward on the road to industrial (comparative) peace.

The paper gives some very interesting data in regard to the matter of welfare work at the Jeffrey Mfg. Company's plant. It evidences clearly that the owners are extremely intelligent people in that they recognize that this welfare work, even if viewed only from the angle of enlightened self-interest, is a paying proposition. But this viewpoint will not obscure the fact that the employees are the recipients of care and attention arising very largely from the impulse of personal sympathy and humanity on the part of the owners. It may be a mere coincidence, but it is nevertheless an extremely suggestive fact, that in the days of industrial peace this element of the personal sympathy of and humanity toward the employee by the employer was almost universally in evidence. That the commencement of troubles between the employer and the employed in industrial matters was synchronous with the waning of this element of personal sympathy and humanity on the part of the employer with and toward his employees is another suggestive fact which may be only a coincidence. Be this as it may, it will hardly be denied that the climax of our industrial troubles has been due to the exhibition on the part of employers, as a rule, of a spirit of unrestrained individualism, and the same thing applies to our troubles in respect of large corporations, railroad and otherwise. This spirit of unrestrained individualism evidenced by our railroad and other large corporations, proceeded until it effected a revulsion toward collectivism and legislation in restrain of this tendency has become part of our statute law.

Unrestrained Individualism Causes Greed

In industrial matters, this spirit of unrestrained individualism was evidenced by the ignorant greed which impelled employers to cut piece-work rates whenever an operator overstepped the earning rate per day which the employer had inwardly determined was the limit that a workman ought to be allowed to earn. This was penalizing energy, which is pretty close to an economic crime. These practices were accompanied by inhumanly long hours. When the thing had gone beyond endurance, labor unions were started, and as a pendulum never swings half-way, but always to the other extreme, the flat rate per day was, in effect, made the basis of all collective bargaining. This, of course, is premiumizing inefficiency, hence is an economic fallacy. But we see that the parent of the flat rate (premiumizing inefficiency) is penalizing efficiency, that is cutting piece-work rates, except as a result of increased equipment or of labor-saving devices. As the employers have and always have had the initiative, they are responsible for the undesirable influences and conditions to which Mr. Grieves refers, and for which he tells them they are responsible to some extent.

But while this combination of enlightened self-interest and the sentiment of personal sympathy and humanity which goes by the name of "welfare work" seems to be a condition precedent to industrial (comparative) peace under modern industrial conditions, it makes quite clear the fact that no system of bonus rewards (efficiency) nor of piece-work rewards under a really intelligent piece-work system can achieve best results unless based upon and accompanied by this welfare work. Neither can it be denied that this combination of welfare work with any system of efficiency bonus rewards or of intelligent piece-work rewards, is at once widely different from unrestrained individualism on the one hand or collectivism on the other. Such a combination is, in effect, a reversion to first principles, that is, to paternalism. The writer is aware that, to the generation born and educated since our civil war, paternalism and collectivism, or, as mostly called socialism, are convertible terms. To these persons anything that is not unrestrainedly individualistic, is socialistic; and as paternalism is certainly not unrestrained individualism, they consider it to be socialism under another name. Their thinking so, however, does not make it so; it does make clear their ignorance of the difference between the two things. As the essence of collectivism or socialism is the equalization of earnings, which is both an economic proposition as well as an economic impossibility, whereas the essence of paternalism is, in effect, a system of government or practice, it will be seen that the difference between the two ideas is vast.

Paternalism in Industrial Matters

Paternalism has been demonstrated to be both possible as well as successful in industrial matters, as well as in matters of government. One need go no further than modern Germany for an example of either kind. As regards matters industrial, the fact is that neither death, disability nor old age has any terrors for the German artisan. He is provided with insurance in event of death, and with indemnity in event of disability or old age, and the things covered by Mr. Grieves' data are included in administration of insurance. Paternalism even comes pretty close to indemnifying him against loss of employment through hazards of fluctuation in business activity. This is effected by the clergy in some districts who organize associations for building houses to rent or sell to artisans. The movement is not confined to any one denomination. Von Ketteler is the Roman Catholic clergyman who is prominent in the movement, and Von Bodelschwingh is the Protestant leader.

That these leaders are both eminently fair as well as practical is evidenced by the regulations regarding loss of employment. They provide that an artisan who is out of employment can retain his house for a given time, even if unable to pay his rent or his instalment, but he must accept any employment the association finds for him. That is, he cannot hold down a chair waiting for the kind of a job he is looking for; on the other hand, the association cannot ask him to become a strike breaker. Right here it is to be remarked that there is a vast difference between the German method of taking care of artisans disabled by old age and the recently installed English method of old age pensions. The latter is pure largess on the part of the government; the former is based upon the employers and the employees both contributing a fixed percentage of the payroll earnings respectively, the government contributing the expense of administration. The German scheme is based on thrift, compulsory thrift perhaps, but who will deny the merits of even compulsory thrift in respect of a man's retention of his self-respect, as compared with the pauperizing effect of largess?

The German System Commended

It is to be hoped that the growth of this paternalistic or welfare movement in our country will result as it seems to have resulted in Germany, that is, as a check to the socialistic or collectivist movement. The last general elections for the Reichstag showed a loss of many

*Practical production engineer.

†See *The Iron Age,* April 13, 1911, pages 908 to 911.

seats, over 40, if not more, by the socialistic party. It is becoming increasingly evident there that the mass of the socialistic party are not really socialists. This applies especially to the socialists in South Germany, whose aims are principally the increase of the paternalistic principle, for instance in the direction of the amelioration of the condition of the rural laborers. These are still, unfortunately, in a relatively backward condition compared with their artisan brethren. The socialists also aim to place a larger share of the burdens of government on the land. At present commerce and indirect taxation carry the major share of the burden.

Real collectivism or socialism—that is, the economic proposition entailed by an attempt to equalize earnings—is, initially, the hall mark of a mental dyspeptic, however well intentioned he may be. It is an impossible proposition so far as its practical carrying out is concerned. The brightest of them, Marx or Lassalle, never was able to respond to Bismarck's insistent demand that they formulate their ideas in some affirmative proposition—some proposition which should embody their ideas of a workable scheme having for its objective the carrying out of their ideas. Notwithstanding their inability to meet this very reasonable demand, they fought his paternalistic propositions from start to finish. Luckily they fought them in vain, and, as said, after a trial of 30 years, Bismarck's paternalistic legislation resulted in a reduction of over 40 in the number of socialistic members elected to the Reichstag at the last general election. Paternalism had been tried, industrially, and not found wanting.

It is the hope of the writer, and of all thoughtful people who have given our industrial situation any careful consideration, that the welfare or paternalistic idea shall have a vigorous growth. They do not believe that labor unionism, as at present led, affords any hope of industrial peace compatible with industrial growth. It has been said that labor unions have come to stay, and, in the sense that disorganized labor is a thing of the past, that is undoubtedly true, but in the sense that organized labor means the success of the closed shop with the flat rate as the keystone of the arch, it is not, let us hope, at all true. There is no conflict, at least no irrepressible conflict, between intelligently organized and intelligently led organized labor and paternalism abroad, hence why should there be here? Germany has found paternalism as applied to industrial problems compatible with an immense growth in her volume of business, accompanied by a great improvement in the standard of living of her artisans and a higher average wage rate. That her standards of education have not fallen goes without saying. It would therefore seem that, looked at from the practical angle, paternalism has made good over there and that the material improvement has not been at the expense of ethical or moral standards of the people at that.

No Loss of Initiative by Paternalism

A great deal is heard about the loss of initiative entailed by the introduction of paternalistic ideas. It seems to the writer that a glance at the data given at the end of Mr. Grieves' article indicates that the value of the initiative lost at the Jeffrey Mfg. Company's works, by reason of its introduction of welfare work, is represented by zero. Certainly, looked at from any angle, the company's operatives and those dependent upon them have every reason to thank God that they lost their initiative. It is a fair inference that a proposition to return them their initiative and take away the welfare work would produce a strike. That there exists any real difference between welfare work and paternalism no one can truthfully say.

It is readily to be seen that, to the operatives of the Jeffrey Mfg. Company, the work results in large savings to them of time (that is, money), not to speak of the saving in the matter of pain and of worry to those dependent upon them. That the work is a dividend-paying proposition to the company alters nothing in respect to these facts as regards the operatives. The system is one form of compulsory thrift as regards the operatives; the German artisan insurance is another form. The concrete value of both these forms of compulsory thrift is so great and so visible to any one who cares to see that talk about loss of personal initiative, except from those whose delight it is to philosophize about things abstract, is distinctly out of place, if they claim to be practical people.

There is another side of this paternalistic work which is seldom referred to, and that is that the output per capita of operatives working under these systems is bound to be greater with the average man than the output per capita where these systems are not in operation. It can hardly be denied that a workman knowing that he is surrounded with every care, and in case of accident provided with expert attention, can and will work in a more contented frame of mind—that is, with less friction—than an artisan not so surrounded, and content is a prerequisite to maximum output per capita. The public press contains a statement made at a trade congress this week that the provisions guarding German artisans against accident are much more ample than they are here or anywhere else; this fact, if followed up, would probably show some more loss of initiative of operatives, as a result of paternalistic care on the part of employers or of governments.

The Check to Socialism

That the introduction of paternalistic methods by the German government in the matter of industrial concerns should result in a diminution of the spread of real socialism does not surprise the writer at all; on the contrary, it is, in his opinion, a natural result and one to be expected. The cause of the growth and spread of real socialism is, in practical life, the swing of the pendulum the other way, the revulsion from the intolerable hardships and injustices which are the inevitable outcome of the application of unrestrained individualism. One naturally looks for the cure of such a state of things in the very opposite of the principles whose application have brought about these hardships, injustices and cruelties; hence the natural disposition to turn to collectivism as the cure-all.

In the last solution, paternalism is practical Christianity, the protection of the weaker, or less intelligent, against the stronger or more intelligent or their stronger of more intelligent fellows. To any one not deluded with the idea of "the equality of man," and to any one who recognizes his duty to his weaker or less intelligent fellow man, paternalism appeals for many reasons, as the intelligent application of the individualistic principle. It does good, yet is not charity, hence does not tend to pauperize its recipient. It is not charity, because it is a dividend-paying proposition, looked at from the employer's angle of vision alone. It is educational, both in respect of theory as well as of fact, hence it has an ethical value as well as a concrete value. It teaches by example, as differentiated from sermonizing or precept, the doctrine of service to one's less strong, or less intelligent, or less fortunate fellow man; and the service takes the form of teaching him how to help himself, how to better withstand contact with unrestrained individualism, if he meets it.

All the improvement in the world has been the result of real education. It follows that existing evils are the result of incomplete education. Recognition of this fact would do much at once to start us right in attacking evils. And so far as an experience extending over years in industrial matters goes, nothing, in the opinion of the writer, is needed so badly as education, real education, for industrial troubles. If there be any form of education more readily absorbable by workers of all classes than the applications of paternalism, or welfare work, it would be a pleasure to have it pointed out. Since the beginning of the world, teaching by example, as differentiated from teaching by precept, has been the kind of teaching which lasted. And no collectivist can fool for one minute, however full he be of the writings of Marx, Lassalle and Bebel, any one who has been shown by paternalistic objective teaching that "there are people who know what is best for him better than he does" and who mean well by him besides, as shown by their actions in concrete shape.

Experience has shown that the collectivist propaganda does not find a soil fertile for the growth of its fallacies, which has been thoroughly plowed with the plow of understanding as regards the "inequalities" of man; which has been cultivated with the seed of obligation in respect of the duty which the brotherhood of man entails upon the stronger and more intelligent of the race, toward their fellows; and which has been watered with the element of personal sympathy and humanity. That manufacturers intelligent beyond the mass of their kind have discovered that cultivating this kind of soil is a paying proposition augurs well for a check to the up-to-now increasing tide of collectivism.

Machine Tool Arrangement*

The Department Plan of Machine Tool Arrangement on the Basis of Equipment

Paper by C. B. Auel,

Assistant Manager of Works, Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa.

It will be found almost invariably that in the original design and lay-out of small and medium-sized manufacturing concerns the tool equipment has been so arranged as to group together operations of a like kind, such as milling, planing, drilling, boring, screw machine work, etc. The reasons for this are:

1. That for each of the principal machining operations there is frequently but a single expert and in order to make the best use of this talent no other scheme is permissible.
2. The centralizing of machines of a kind tends to decrease the number required for a given output.

As a result of these there follow logically:

3. Accuracy and speed in workmanship.
4. Uniformity in methods.
5. Economy in floor space.
6. Minimum distribution of power.

Under this method of production a shop may be said to be divided into two portions, "feeder" and "assembly" sections respectively, the feeder sections making the parts from the raw materials and delivering them either to storerooms or to assembly sections where they are assembled into the complete apparatus preparatory to test and shipment. There will, in general, be a number of feeder sections entirely independent of one another, and there may, likewise, be one or more assembly sections. A production, planning or routing department usually determines the manner in which orders are to be brought through, arranges delivery dates, keeps track of the orders as they progress through the shop and exercises general supervision over production.

The Original Westinghouse Arrangement

The East Pittsburgh plant of the Westinghouse Electric & Mfg. Company was operated until about three years ago along lines which may be said to have been departmentalization, partly on a basis of tool equipment as outlined and partly on a basis of product, during which time it met conditions fairly satisfactorily.

However, in any growing manufacturing concern there comes a time when the advantages of the preceding arrangement are more than offset by the difficulties incident to its successful operation. The increase in volume of semifinished parts passing from feeder to assembly sections, with the accompanying increase of clerical and other work and the multiplication of foremen and superintendents concerned in the manufacture of any one class of product, results in delays and increased expenses of various kinds which cannot be overcome, nor can the recurrence of them be prevented.

Perhaps the greatest drawback of such a scheme is the inability to fill orders promptly. This is especially apparent during periods of business depression, when quick delivery is of larger importance than at any other time. The amount of stocks on hand is then usually lowest, and accordingly a larger percentage of apparatus requires to be built from the ground up to fill customers' orders. Under these circumstances it becomes imperative to place so-called "rush," "forfeiture" and other orders of a like nature in a class by themselves and to conduct them personally, as it were, through the shop.

In doing this, though, other orders are relegated to the background, with consequent disastrous results, particularly in the matter of dissatisfaction on the part of the customers from whom such orders are intended. Of course, the greater the volume of these special orders, the greater the ensuing confusion and delay in connection with other orders, so that this method of procedure is not a solution of a difficult problem but simply a makeshift, a temporary expedient, to be abandoned as quickly as some more rational method presents itself.

Another vital difficulty, perhaps equal in importance to that already mentioned, is the matter of divided responsibility, no one individual being primarily responsible for any complete piece or class of apparatus. Such being the case, it is exceedingly difficult even to make an attempt to ameliorate or to improve conditions which are known to need attention, for the reason that there seems to be no proper place at which to commence the betterment work.

As a result of these conditions and without going any more minutely into an analysis of the difficulties, it is reasonable to assume that, in consequence of shipments being delayed and responsibility divided, "work in progress" and stocks, raw and finished, will be high, and such proves to be the case.

Change to Self-Contained Units

Recognizing for the reasons stated that the methods of manufacture were proving inadequate to handle the increasing volume of business, the company spent considerable time in investigating the methods of other large companies in similar lines of business, with the result that it was believed advisable to modify the original scheme in favor of so-called "factory departmentalization"; that is, to divide the plant into a number of separate units, as self-contained as the nature of the work of each would permit. In other words, this means to treat the units like independent factories, as it were, housed together under the same roof for mutually advantageous purposes, yet buying from and selling to one another their various commodities as circumstances seem to make desirable. A scheme of this kind naturally causes a number of duplications of the organization and equipment. While this is so, it does not necessarily involve any material increase in either, since the change is more in the nature of a rearrangement of the existing equipment and organization, with the addition here and there of a few tools which, under the original plan, were used in common by two or more departments. Even this may to some extent be avoided by assigning such tools to the department requiring them most and permitting the other departments to have their work done on requisition.

The Plan Found Very Successful

In introducing this scheme in the East Pittsburgh Works, it was deemed advisable as a precautionary measure to put it into effect in but one department only, further progress along this line to be dependent wholly upon the results obtained in it. This was accordingly done and with very gratifying results almost from the very commencement. It was found, as anticipated, that among other advantages shipments were facilitated and "work in progress" and stock decreased, all to a very marked degree.

Comparing the routine in this particular department under the original and the modified plans it is found that in the original the work was performed by 22 sections located in 13 independent departments; in the plan as modified, the same work is now done by 13 sections in 7 independent departments. But this by no means emphasizes the difference even in the routine, for the reason that under the modified plan authority for an entire line of product is vested in a single individual, who, therefore, is enabled to exercise his discretion as to the raw and partly finished items to be carried. By a judicious selection of these, he has at all times a certain amount of stock on hand and is thus to a large extent not dependent in the matter of deliveries on the other sections, outside of his authority, which supply him with materials.

In consequence of the excellent showing made in the department selected for trial, departmentalization was gradually extended throughout the plant until now the work has been almost completed. Though not yet perfected, some of the details still requiring to be straightened out here and there, the general results have been a confirmation of those obtained in the department in which the scheme was first tried.

Of course, it is hardly practical to carry this departmental idea into all sections; for example, in the pattern

*Two papers read before the National Machine Tool Builders' Association, Atlantic City, N. J., May 19, 1911.

shops and foundries, or in certain other places where either the work or the equipment is very special. Neither has it been deemed wise to include disk grinding or polishing, on account of the deleterious effect of the dust and fumes on other machines in the vicinity, though certain work of this kind is being done in some of the departmentalized sections where facilities for carrying off dust and fumes have been provided.

As at present arranged, there are in the works eight fairly self-contained departments as follows:

1. Railroad, mining and crane motors.
2. Power, for large generators and motors.
3. Control, for railroad and industrial control apparatus.
4. Detail, for switchboards and accessories.
5. Small motor, for small power motors.
6. Transformer.
7. Locomotive.
8. Industrial, for medium sized motors.

Besides these, certain feeder sections still continue as follows: Coils, punchings, blacksmith, cabinet and pattern-making, screw machine, foundries, etc.

With respect to the screw machine section, it may be stated that this has been departmentalized to some extent, though the greater portion, for the manufacture of such parts as are made in large quantities and carried in stock by the central stores, remains unchanged. Regarding the other feeder sections, it is possible that some of them may in due course be departmentalized, without necessarily changing their present geographical location, but simply be assigning in each a certain proportion of the floor space and the tool equipment to each of the already departmentalized units.

The Advantages Secured

The results obtained in the other departments have been, as already stated, but a repetition in greater or less degree of those in the department where the modified plan was first tried out. Summarizing the various advantages they may be said to include:

1. Centralizing of authority in the production of each class of apparatus.
2. Decrease in time required to fill customers' orders.
3. Increase in output in a given period.
4. Decrease in "work in progress" and in stocks.
5. Saving of floor space.
6. Decrease in handling of materials.
7. Decrease in clerical labor.
8. Decrease in indirect expense or overhead burden.
9. Increase in individual initiative.
10. Healthy competition between similar sections and departments.

In the matter of accounting, departmentalization has been carried even further than it has with the manufactured products, for every part of the works, whether a feeder section or a completely departmentalized unit, is now self-contained in this respect, giving a total of 53 such units in all. Their comparatively small size permits the ready compilation of the transactions of the preceding month, so that all inter-sectional and inter-departmental accounts are therefore balanced on a monthly basis. A further advantage of this feature is that each unit has its own percentage of indirect expense or overhead burden, figured on its total productive labor, which percentage is changed from time to time as circumstances seem to warrant. Order costs are compiled by the feeder sections and departments themselves.

It may be stated that it is not the aim to show either a profit or a loss in any of the sections or departments, so that when either of these conditions arises the overhead percentage is altered accordingly. Every month each of the units in the works is provided with a set of charts or curves giving a continuous record of its performance in total productive labor, total expense labor and total expense materials, the expense items being also segregated along various helpful lines, all shown directly in dollars and cents and many as a percentage of total productive labor as well. This percentage is considered as a measure of the expense labor and material efficiency.

Systems of Wage Payment Used

Regarding systems of wage payment, day work, piece work and premium work are all used, in the proportion at the present time of 35, 14 and 51 per cent, respectively.

Time limits and piece work prices are set by duly qualified experts and only after careful consideration of all the factors involved. In determining these a base is first set, which base is assumed as the time required to do the work by the average skilled workman. This becomes the time limit, in the case of premium work; or, from it is figured the piece work price where piece work is used. Upon the completion of each job, the actual time taken is compared by the time clerk with the base time, and if the former is in excess the matter is further investigated. In one of the departments all time slips in each section at the end of each day are totaled twice; first, with reference to base time, and, second, with reference to actual time, the ratio between them being the efficiency of the section as far as productive labor is concerned. This scheme applied to a workman's time slip will likewise give the individual efficiency and was originally so used, it is believed, by Harrington Emerson. It is possible that the scheme may be applied generally in due course.

Departmentalization on the basis of product has likewise been extended so as to include the engineering department and to a somewhat less extent the sales correspondence department; in fact, in certain instances the engineers and the correspondents are located alongside of one another with the result that much of the routine work in connection with orders is facilitated.

In conclusion, it will be appreciated that in what has been said within the limits of this paper only the barest outline has of necessity been given of a few of the present methods of working of the Westinghouse Flectric & Mfg. Company from the viewpoint of departmentalization on the basis of product. It is not intended in any sense to convey the idea that this method of operating a large and growing manufacturing concern is the only correct way; but, from the exeperience of our company, it is quite evident that it is the best method for its particular needs. Nor can any general statement be made as to when it would appear advisable for a similar concern to change over from manufacturing on a basis of tool equipment to manufacturing on a basis of product, as experience alone would seem to be the guide.

Paper by F. C. Kent,

Superintendent Pierce-Great Arrow Company, Buffalo, N. Y.

Inasmuch as the product of some concerns is diversified, and machine tools used for one class of product would not be suitable for the manufacture of another class, this discussion would be applicable only in its entirety to about 80 per cent. of our manufacturing establishments.

My earlier training in the metal work industries has been with the department plan of machine tool arrangement on the basis of production. The transition to an enthusiast of the department plan of machine tool arrangement on the basis of equipment has been gradual. I have been guilty of considerable backsliding, caused usually by listening to some silver tongued systematizer, but after my experience of the last four or five years I can positively say "never again." We have been afflicted with a plague of theories. What we need now is demonstration.

It may be interesting to note that I have had a variety of subjects upon which to try out this proposition; for example, cheap metal specialties, bicycles, motor vehicles, electric locomotives, coal mining machinery and general jobbing and contracting work. The quality of workmanship and material has varied from the roughest to that of the very highest grade. The weight of the finished product ranged from a few pounds to many tons.

Decided Increase in Profits from This Plan

Some of these concerns were very thoroughly organized on the basis of the product plan, but in every case where a change has been made to the basis of equipment there was a decided increase in profits, together with a marked increase in wages of both productive and non-productive labor.

The remark that this is the age of specialization in the machine shop is true, but how many of us comprehend the truth? Manufacturers are just beginning to resolve into first principles the various manufacturing processes of their finished product. They have yet to apply this analysis with exactness to the problems of machine tool efficiency in the manufacture of their product. I believe there is a lack of knowledge of the possibilities

of the most common type of machine tools in every shop; in fact, there is not one shop in ten in which the possibilities of even the engine lathe is thoroughly understood.

Arranging on the Basis of Production.

There is no doubt that development along this line has been retarded by the system of arranging tools on the basis of production. Department superintendents and foremen have had to cover too wide a field; their thoughts and energies have been distracted by the multiplicity of things needing attention every minute of the day. Some of you, who have been shop foremen in the past, must concede that there are a few things that need constant attention regardless of the system you may have devised to relieve you of the clerical and detail work. Furthermore, I believe it to be a physical impossibility for a foreman to produce a well balanced and maximum product with machine tools grouped on the basis of production. A few words from an editorial in the *Motor Age* of March 30 will illustrate this point with respect to the operator. It is as follows:

> The arrangement of machinery was not symmetrical. Drills were placed side by side with planers, and planers with lathes, and lathes with grinders. It was discovered that this mixing of operators brought about an unconscious confusion in the mind of the workman. The workman at the lathe might be a master of his job, but his energies were not concentrated on it. One minute he was watching a grinder at his right, the next a drill at his left, with the result that his efficiency was impaired and it was impaired because of distracting environments.

Now, if the operator's mind becomes distracted under such conditions, when he has nothing to think of but his machine and the subject he is machining, what must be the state of mind of the foreman of this department?

Men Have Hobbies

A foreman as well as an operator has his hobby, and if he did not ride it he would not be human. He may be fascinated with the lathe but despise the sight of a grinder. The operations on the lathe will receive his best attention whether the work done on the other types of machines need supervision or not, in spite of the fact that he may be the so-called all-round mechanic. He is more or less a jack-of-all-trades, flitting from one job to another without learning the real possibilities of any of the machines under his charge. These conditions preclude thinking of labor and machine efficiency as applied to his department.

For general supervision the plan of grouping the machines on the basis of production is disastrous in most factories because of the impossibility of effecting a working balance between the various operating departments and of making the production equal in all departments.

The grouping of machine tools on the basis of equipment is the only solution for better and increasing production. This is true because no man becomes an expert in all lines of mechanics. He increases production because he intensifies or specializes along narrow lines.

The foreman who concentrates his energies on one class of machine tools, and is alive to the possibilities of his equipment, has the opportunity of his life for increasing to the highest degree the labor and machine efficiency of his department.

Departmental Supervision

The problem of securing proper departmental supervision becomes less serious under the system of grouping machines according to equipment rather than according to production. I have seen foremen in charge of departments equipped with lathes, drills, grinders, etc., who were unable to get satisfactory results, but when these same men were placed in charge of one special class of work with machines with which they were entirely familiar, they became interested and enthusiastic, with the result that their earning power and efficiency were greatly enhanced.

Nor is it where the human element is concerned that the plan of grouping machines with regard to equipment is superior to the plan of grouping with regard to the product. It has been demonstrated that less permanent investment is needed because less floor space is required. Consequently it admits of a better lighting system and requires fewer lights and less heating appartus. The saving in pulleys, hangers, shafting, belting, etc., is considerable. Power, labor and supplies for the up-keep of the extra equipment is also saved.

In fact, on several occasions the rearrangement of machinery to the plan based on equipment has saved the necessity of erecting new buildings to increase production. In one change I recall that 110 hangers and other power transmission equipment in proportion were eliminated. When machines of the same type are grouped together it is possible to discern their production capacity and set an efficiency standard with greater accuracy. It also assists the foremen in selecting the better types of machine tools and in eliminating the poorer types.

Organized on the basis of product, there is a tendency of department foremen to carry a stock of their own jigs, chucks of various sizes, milling machine and lathe arbors, drills, taps, dies and cutters of all sorts which are frequently duplicated in other departments. The diversity of opinion among foremen about high speed steels, emery wheels, etc., is accountable for the great variety of them found in so many manufacturing plants organized on this plan.

This duplication and confusion incident to the handling of small tools and apparent lack of exact knowledge may be obviated by the installation of a central tool storage, equipped with first-class grinding facilities and supervised by a tool specialist. By this method worn tools may be properly ground and kept in perfect condition, ready for use when needed. This arrangement makes possible the standardization of emery wheels, sizes of tool steel and all kinds of shop supplies.

The Arrangement in the Pierce-Arrow Shops

At the Pierce-Arrow Motor Car Company the arrangement of machine tools on the basis of equipment is carried out to a much greater degree of refinement than at most shops operating under this system. All lathes are not only ground to form a department, but they are subdivided into smaller groups according to size, class of work, etc. For instance, one section known as the turret department is divided into groups of automatic chucking machines, automatic screw machines, flat and hexagon, turret lathes and hand screw machines. The larger turret lathes of the Gisholt type and vertical boring tools are not included in this department, but form separate groups. The hand and spur gear cutters form separate groups. The milling machines are classified as vertical, horizontal, Lincoln type and hand groups. The drilling machines are divided into radial, heavy duty, medium and sensitive groups. The grinders are grouped as internal, plain and surface. Supervision is effected by placing an assistant foreman in charge of a subdivision of machines. He is responsible to the foreman who has direct charge of the departmental group. The foreman is under the direct supervision of a general foreman or assistant superintendent, of which there are several. They in turn receive their instructions from the general superintendent.

In our production engineering department, which has been instituted for the purpose of affecting a more closely related shop organization, we have at present a working force of three mechanics and three clerks, the former having been in the employ of the company for a number of years and understand our product thoroughly. The head of the department has served as draftsman, tool designer, head of specification, pattern and material order departments, and is intimately acquainted with the materials used in our product. The second is a pattern maker, designer of special machinery and tools, and is also a machinist. The other is an expert tool maker, former tool room foreman, and has had considerable experience in the manufacture of special machinery.

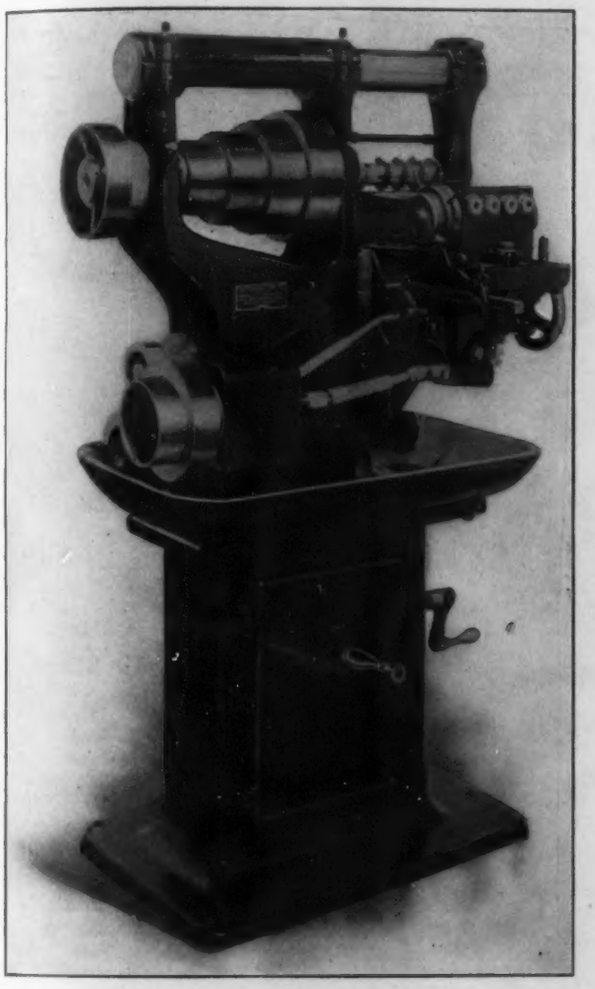
A suggestion blank pad is to be found on every shop foreman's desk. These blanks are used by the foreman and his men for the purpose of bringing to the attention of this department such changes in manufacturing operations and handling of our product that occur to them from time to time. The suggestions are carefully analyzed by this department and if no objections to their adoption are found by them or by the department superintendent, by whom the suggested changes are finally approved, the changes are made. On the other hand, if the suggested changes are rejected, the reasons therefor are reported to the men who make them.

When new parts for our production are determined upon, this department, with the assistance of the shop foremen interested, carefully analyzes the operations necessary for each part, so as to assist our chief tool draftsman in determining correct working points in making quick acting and economical tools.

New Automatic Tap Fluter

A recent product of the Bickford Machine Company, Greenfield, Mass., is an automatic machine for fluting four taps or reamers simultaneously. The machine is entirely automatic in operation and after the work is placed between the centers the carriage is moved forward and back without any attention and the cutters index at the proper intervals for the different numbers of flutes.

A short spiral gear cut in each spindle and meshing with a spirally fluted cross shaft controls the indexing



An Automatic Machine for Fluting Four Taps and Reamers Simultaneously. Made by the Bickford Machine Company, Greenfield, Mass.

of the centers. At one end of this cross shaft is an index collar having the required stops for controlling its motion. Power is applied to this cross shaft through a second collar which is connected to the index collar by a ratchet. The second collar is revolved as the carriage advances and a tension is put on the index collar through a pull spring and the ratchet teeth, so that when the carriage returns a special device unlocks the index and the cross shaft is revolved and turns the centers driving the work. A disk on the opposite end of this cross shaft has a number of flat places corresponding with the number of flutes required milled on its circumference. The arrangement of these flat places is such that a stud set in a bar operating the feed just clears them. As the disk turns with the cross shaft, the part of its periphery which is not milled depresses this stud and disengages the feed while if the indexing is only partly completed the portion of the disk between the flat places will stop the movement of the carriage. Another feature of the feed mechanism is a disk carried at the end of the main feed shaft, having stops on its circumference which operate a small universal shaft that in turn shifts the clutch in the feed gear box.

The carriage is arranged so that it will stop if the indexing is not properly done as well as at the completion of the work. A quick return at the rate of 5 to 1 is secured by the use of a gear box and a special device for changing the direction of the table travel. The gear box contains three sets of compound gears and a sliding clutch to reverse the direction of the telescope shaft and worm feed to the table. This clutch is controlled by a special device which disengages it from the forward gear and engages it with the reverse gear or vice versa without any knocking or pause while the direction of travel is being changed.

The cutters are supplied with oil from a tank in the base of the machine. The tail block centers are actuated by heavy coil springs and are operated by a specially designed curved lever which does not make it necessary for the operators' hands to be placed near the cutter.

Two sizes of machines are built, one for handling work up to ½ in. in diameter, which is the size illustrated, and the other for fluting tools having a maximum diameter of 1½ in. The smaller of the two machines weighs 1100 lb. while the larger is 700 lb. heavier and in addition has back gears and fixtures for squaring the shank of the tap.

A Reversible Window Ventilating Device

A new and somewhat novel ventilating outfit by which fresh air can be blown into a room or foul air exhausted from it has been brought out by the American Blower Company, Detroit, Mich. The device is intended to be placed in the upper sashes of windows, in transoms or the ends of skylights and includes a 12½-in. motor-driven Ventura fan which was illustrated in *The Iron Age*, May 18, 1911, a cast-iron housing and a worm-gear reversing

An Automatic Machine for Fluting Four Taps and Reamers Simultaneously, Made by the Bickford Machine Company, Greenfield, Mass.

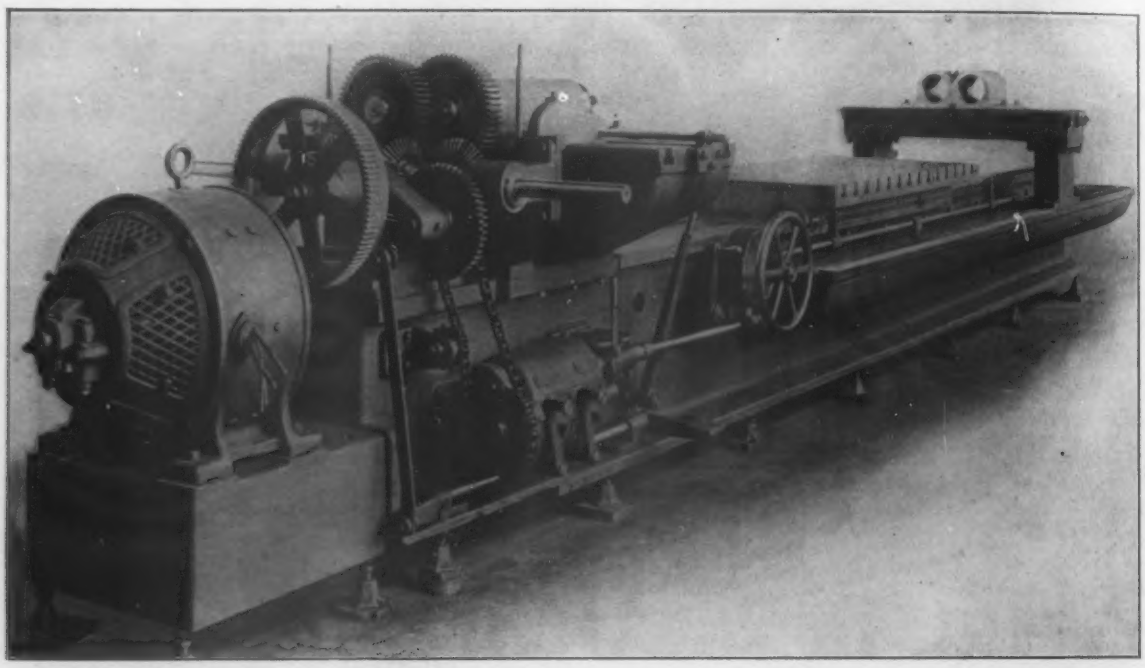
mechanism together with the rod, the bearing and the handle.

The power for operating the motor is secured by screwing a plug into the nearest electric light socket. The employment of an ingenious reversing mechanism enables the air to be discharged straight ahead, directly toward either the ceiling or the floor or at any intermediate angle. In this way it is possible to supply a room with pure fresh air under a slight pressure without subjecting the occupants to a draft. A simple turn of the hand wheel controlling the reversing mechanism changes the fan so that it exhausts foul air from the room.

Traction elevators for Chicago's tallest building have been decided on. The building is the Heisen office structure, one story higher than the Blackstone Hotel. There are to be 14 elevators of the overhead traction type, having a speed of 350 ft. per minute and a travel of 250 ft. They are to be equipped with the Ideal interpole motors built by the Ideal Electric & Mfg. Company, Mansfield, Ohio, and are being installed by the H. J. Reedy Company, Cincinnati. Each motor is of 45 hp. capacity and and is provided with a speed showing controller, allowing for a rate of travel of 175 and 250 ft. per minute as well the 350 ft. speed without regard to load.

Machine for Boring Engine Valves

To bore the four valve ports in Corliss engine cylinders the Beaman & Smith Company, Providence, R. I., has developed a two-spindle adjustable boring machine. In this way it is possible to bore port holes ranging from 3 to 9 in. in diameter and for any distance up to 6 ft. in length, two at a time, while they can be spaced at distances ranging from 8¾ to 37 in. on centers. One of the special features of the machine is the arrangement employed to secure accuracy in boring these very long holes. The boring bars holding the tools are revolved in one position, and the work is fed in either direction past the cutting points, thus eliminating inaccuracies due to the springing of the boring bars.



Beaman & Smith Two-Spindle Machine for Boring Valve Ports in Engine Cylinders.

Four bolts and a driving key in each spindle connect the boring bars to the spindles and the outer support for the former is constructed in the form of a bridge. This support rests upon projecting ways fastened to each side of the bed and has an adjustment of 14 ft. along the line of travel. It is entirely independent of the table and the latter can pass under it. A small lever at the right of the feed box controls the reversal of the feed mechanism. In this way the table can be fed in one direction while the roughing cut is being taken, stopped while new tools are being inserted and the finishing cut taken as the table feeds back. A quick power traverse in either direction which is operated independently of the spindle drive by a small motor on the back of the bed is provided for the table. This traverse is operated by friction clutches controlled by the long lever below the spindle saddle and enables the table to be run back quickly while the bars are not revolving, an arrangement which prevents scoring of the finished bore by the tools.

The table has a travel of 13 ft. 4 in., and working surface measures 36 in. in width and 6 ft. long. A large diameter screw working in a bronze nut feeds the table, ball bearings taking the thrust. The feed for the table is positive and the mechanism, all of which is entirely protected from dirt and chips, consists of a set of gears in a chain-driven feed box and a worm and worm wheel which transmit the power from the gear box to the feed screw. An automatic trip in either direction is furnished for the feed as well as a hand wheel for fine adjustment.

A 10-hp. motor drives the spindles, which run in taper bronze boxes having a take-up for wear, through a reduction gear having a ratio of 36 to 1. To take care of the variation in the distance between the centers of the holes, the power is transmitted from the large driving gear to a shaft running at right angles to a line joining the spindle centers. Each head has a bracket attached to it and carries a bevel gear which slides on this shaft, and transmits power from it to the spindle driving gear. In this way the spindles can be located at any desired distance from 8¾ to 37 in. between centers without altering the driving mechanism. A foot lever on the side of the bed near the feed box operates the large brake which is provided for the driving gear.

The Vesta Gas Range & Mfg. Company, recently incorporated, has purchased the plant of the Chattanooga Stove Works at Chattanooga, Tenn., which it has enlarged and equipped thoroughly for the manufacture of gas range, steel ranges and gas cook stoves. The buildings of this plant are constructed of brick. The warehouse and mounting departments occupy a building 60 x 280 ft., four stories. The foundry is 65 x 220 ft. The patterns are of aluminum match plates. C. C. Huntington is president, E. Schmalzried is vice-president and M. H. Coffey is secretary and treasurer. The president has had a long experience in the stove industry and is thoroughly familiar with the requirements of the trade in the locality.

The Panama Canal, it is officially stated, is three-fourths completed. It is now seven years since the work began, in which time the removal of material from the line of the canal has amounted to 138,000,000 cu. yd., leaving only 44,000,000 yd. to be excavated. The installation of the gates for the locks on the canal has begun.

It has been brought out by German statistics that agriculture suffers far more from accidents than any other occupation. Of the total number of mishaps resulting in temporary disability, 45 per cent. occur in agriculture, 9 each in iron and steel trades and in building operations, and 8½ per cent. in mining. It is explained that it is natural that the agricultural laborer should be especially subject to accident, for he has to handle teams, machinery, and explosives, and is too much a jack-of-all-trades to be skilled in any one.

A manganese steel tire 2 in. thick, after 19 months' use in crushing grout from fire brick in a 9-ft. dry pan in a clayworking establishment, was found easily good for another year by G. W. Kreisly of the Edgar Allen American Manganese Steel Company, McCormick Building, Chicago, Ill. In a paper before the twenty-fifth annual convention of the National Brick Manufacturers' Association at Louisville, he explained that a car wheel tire 4 in. thick had a wear of only six months, while the manganese tire at the end of the period stated was concaved not more than 3/32 in. on a 10-in. face.

Corrigan, McKinney & Co. have completed their second blast furnace in Cleveland. This stack will probably not be blown in until market conditions improve.

The Machinery Markets

There are large inquiries for machinery for export in the New York market and the call from the railroads has improved. In other sections of the country business is somewhat quiet. Inquiries have fallen off in Cleveland, but the trade there is bidding on a list of 150 machines for a technical high school. In Cincinnati foreign business is occupying the most attention and domestic buying is of the hand-to-mouth order. More encouraging reports come from Detroit, where the automobile makers are especially busy and are buying generously. Business is uniformly quiet in New England, but an unusual number of factory extensions, which will result in buying in the future have been announced. In Philadelphia the market is irregular and the outlook is not encouraging. The demand is good in San Francisco, but the buying movement there has fallen off somewhat. In Texas business is on the increase and an excellent trade is being done in irrigation machinery, while an unusual number of new enterprises calling for mechanical equipment have come forward. There are prospects of railroad buying in the South, but the general demand there is not very good.

New York

NEW YORK, May 24, 1911.

The New York, Ontario & Western Railroad has about closed out for its large list and there are indications that other railroads will shortly buy. The New York Central Railroad has been renewing its inquiries on a large list which the company sent out last August and against which nothing has been purchased. If this business is closed it will mean an expenditure of about $75,000. From all accounts some good business will shortly be placed in this country for a large ship building plant in Brazil. A New York firm has been making inquiries for a large amount of equipment, and assurances have been given that American machinery will be given preference. During the last week inquiries from domestic manufacturers increased to a large extent, but judging from the tone of some of them the matter of placing orders will depend largely on future business developments. Foundrymen report that inquiries for machinery castings have increased, but actual business is not very good. Manufacturers seem to show a great interest in prices, but they appear very cautious about placing orders. The demand for some classes of automatic machinery is unusual. Makers of automatic screw machinery, for instance, declare their May business to have increased to such an extent that the month promises to be the best business month of the year. Corliss engine makers also note an increase, but the call for the general line of metal working machinery is not very good. Machine tool builders, as a rule, are working to about 60 per cent. of their manufacturing capacity.

The Oriental Metal Bed Company, Hoboken, N. J., has awarded a general contract for a plant to be erected on Clinton street, between Eighth and Ninth streets, that city. The building will be 60 x 200 ft., four stories. The cost, including the equipment to be installed, will be about $29,450. The company will move the machinery now in its present plant and some new metal working equipment will be added. All the machinery will be electrically driven.

Armour & Co., 30 Church street, New York, will erect a large by-product plant at Chrome, N. J. The company is planning to build a main structure, 300 x 600 ft., of mill construction, and the plant will be equipped with special machiery for the manufacture of fertilizers. The machinery details are being worked out in the Chicago office.

The Goulds Mfg. Company has completed plans for extensive additions which it will at once make to its plant for the manufacture of pumps at Seneca Falls, N. Y., at a cost of about $250,000. The new buildings will comprise two machine shops each 150 x 350 ft., one story, and a four-story building, 110 x 250 ft.

The Benedict Mfg. Company, Syracuse, N. Y., manufacturer of portable electric lights, etc., contemplates the erection of a large addition to its plant.

The main building of the extensive lithographing plant to be built by the Huebner-Bleistein Patents Company, Dewey avenue and the New York Central Railroad Belt Line, Buffalo, N. Y., will be 122 x 290 ft., one story, and of brick with concrete floor and roof. Plans are being prepared for a power house and a machine shop, and other buildings will be erected later on the company's site of 12 acres. The general offices of the company are in the Sidway Building, 775 Main street.

The mayor and comptroller of the city of Buffalo have been authorized to issue 20-year bonds for $300,000 for the purpose of equipping the new water-works pumping station.

The Standard Oil Company is building a one-story steel car repair shop at its Atlas Works, Elk and Babcock streets, and the Buffalo Creek Railroad, Buffalo.

The Buffalo Wire Works Company, Buffalo, is building a four-story and basement fireproof factory and office at 320 and 322 The Terrace, adjoining its present plant. Considerable additional wire-weaving equipment will be provided.

The General Drop Forge Company, Buffalo, is adding to its plant at Elmwood avenue and the Erie Railroad a one-story steel blower house.

A factory for the manufacture of wire products is to be erected at Gouverneur, N. Y., by the Dixon Wire Company, Dixon, Ill. The cost will be about $75,000.

The Eastern Concrete Steel Company, Buffalo, has received contract from the Commissioner of Public Works, that city, for the construction of two tunnels under the tracks of the New York Central Railroad at the Front avenue pumping station of the water works for discharge mains for new pumps Nos. 3 and 4.

The Universal Fiber Company, Rochester, N. Y., recently incorporated with a capital stock of $200,000, is having plans prepared for a manufacturing plant to be located at Penn Yan, N. Y. The incorporators are John A. Lewis, president of the Fibre Box Company, Rochester; John R. Taylor and Lyman J. Baskin, Rochester.

The Pennsylvania General Electric Company has plans completed for building No. 14 of its new plant at Erie, Pa. The building will be 75 x 400 ft., five stories, of brick and reinforced concrete.

New England

BOSTON, MASS., May 23, 1911.

The decision in the Standard Oil Company case promises, according to general opinion in New England, to have an excellent effect upon the business situation, because it removes a bugaboo, and also because a principle is established which should relieve most of the larger combinations of liability under the Sherman act. Business has not improved as yet, however, and is pretty uniformly quiet, among the dealers as well as with the manufacturers. Confidence in the future is shown by an unexpectedly large number of announcements of factory extensions. The Boston & Maine Railroad has not yet sent out the machinery list for the Concord shops, nor has it come to a decision on the bids submitted weeks ago for the shops at Lyndonville, Vt.

While the plans of the Artistic Bronze Company for the removal of its works from South Norwalk to Bridgeport, Conn., are not complete, the purpose is to make the change this season, with works in the western part of Bridgeport. The company proposes to manufacture builders' hardware and furniture trimmings on a larger scale. The only machinery which has so far been decided upon and for which the company will be in the market is electric-driven polishing and buffing lathes.

The International Silver Company's plans for the season include the erection of a four-story building, 58 x 122 ft., which will be an addition to Factory H, Meriden, Conn. It wil be devoted to the manufacture of the Wm. Rogers Mfg. Company silverware.

The Upson Nut Company, Unionville, Conn., manufacturer of bolts, nuts and carriage hardware, will increase its works by adding a story to a present building, 45 x 185 ft.

The Plume & Atwood Mfg. Company, Waterbury,

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Conn., is erecting a three-story building, 46 x 117 ft., which will be devoted to a machine shop and storage.

The Terry Steam Turbine Company, Hartford, Conn., will build an addition to its plant 30 x 200 ft. The growth of this business has been very rapid, the present shops having been occupied but a comparatively short time.

The Lee Steam Turbine Company, New Haven, Conn., has been incorporated in Connecticut with capital stock of $150,000, to manufacture the Lee steam turbine. The incorporators are Henry B. Lee, New London, Conn., and Winthrop G. Bushnell and Samuel C. Morehouse, New Haven.

The Gervais Electric Mfg. Company, Hartford, Conn., has been organized to manufacture electric materials, supplies, light hardware and specialties. C. E. Gervais is the president, E. R. Low secretary, and Marshall I. Smith treasurer. The company is not yet ready to give out details of its manufacturing plans.

The Underwood Typewriter Company, Hartford, Conn., will erect an additional building this season, to be 50 x 200 ft., six stories. This company has increased its works consistently and rapidly for a number of years, and has been a large buyer of machinery and other equipment.

The new plant of the New London Ship & Engine Company, Groton, Conn., is ready for operation, and will immediately begin the manufacture of the engines and other machinery for the boats which the Electric Boat Company will build for the United States Navy.

The United Dry Drug Company, Boston, Mass., has abandoned its purpose to establish a large plant in the West, and instead will erect large additions to the works at Boston. The contract has been let for an eight-story building for the manufacture of confectionery, to contain 112,000 sq. ft. of floor space, of brick, steel, concrete and tile, the purpose being to create an entirely fireproof structure. Another building will add 81,000 sq. ft. of floor space.

The New Haven Pulp & Board Company, New Haven, Conn., will erect a four-story brick and concrete building, 67 x 131 ft.; Cheney Bros., South Manchester, Conn., an addition to their box shop; and the Day-Emerson Shoe Company, Brockton, Mass., a new shoe factory.

Philadelphia

PHILADELPHIA, PA., May 24, 1911.

Transactions in the local market have been on the same irregular basis that has prevailed for some time. Manufacturers and merchants report current orders as being small and the outlook for the immediate future not particularly encouraging; in fact, it is hardly expected that much betterment in the demand for tools will be shown until the general market conditions show improvement, and how soon that will be is difficult to say, although the trade looks forward to a decidedly better buying movement in the early fall. While reports are heard of possible railroad buying in some districts, there is little news of a favorable character from the railroads in this territory; in fact, operations are in some cases restricted, owing to the labor situation. There is considerable business pending in both boilers and engines, usually of the moderate and smaller sizes, and as inquiries are frequently put out about the time plant improvements are begun it is usually some time before the prospective business actually develops into orders. Business in second-hand machinery and tools continues to drag. The smaller manufacturers of special machinery continue fairly busy, but the makers of the larger and heavier types of special equipment, used in railroad shops and general work, find the demand quiet and are not very fully engaged.

The Baltimore & Ohio Railroad has an inquiry out for a valve-seating machine.

W. E. Dyer, engineer, Land Title Building, is taking estimates for a one-story power house, to be built of brick, 40 x 74 ft., at the manufacturing plant of the Belber Trunk & Bag Company, 1641 North Hancock street. The same engineer will also take estimates for the installation of a new boiler and engine equipment for the new plant, but has not fully decided as to the requirements.

The Tabor Mfg. Company, manufacturer of foundry molding machines, which has been operating under a New Jersey charter, is preparing to transfer to a Pennsylvania charter, in order that plans for the erection of its proposed new plant, to be built near this city, may be concluded. It has arranged the purchase of a tract of about five acres on which the new plant, for which Dodge, Day & Zimmerman, engineers, have prepared preliminary plans, is to be erected. A charter with a capital stock of $150,000 will be taken out and the capital increased as required for the erection and equipment of the new plant. The company has not decided when it will go ahead with the work of building, but expects to do so in the near future.

Ballenger & Perrot, architects and engineers, have, it is stated, completed plans and specifications and are taking bids for the erection of a large baking plant to be built for the Acme Tea Company at Twenty-fifth and York streets. The plans include a main bakery building, offices and a power house, occupying a plot of ground about 162 x 225 ft. The buildings are to be of reinforced concrete and brick construction.

The Gilbert & Barker Mfg. Company, Springfield, Mass., manufacturer of Springfield gas machines, which has had its local office and demonstrating plant at 124 North Twelfth street, this city, has removed to new quarters in rooms 645 and 647 in the Bourse Building.

Cramp & Co., contractors, have the contract for the erection of the new manufacturing building to be erected at Beach and Palmer streets for the American Can Company, of which previous mention has been made.

The Philadelphia Electric Company has taken title to a plot of ground approximately 37 x 65 ft. at the northwest corner of Sixth and Susquehanna avenue, which, it is stated, wil be used as a site for a sub power station.

The Abrasive Material Company, now located at Seventy-second and Upland streets, has acquired property at James and Fraley streets, Bridesburg, this city, and is now taking estimates for the erection of a new plant, including a one and two-story main building 124 x 348 ft., with a wing 68 x 124 ft. and an office building 36 x 43 ft., from plans by Stanford Lewis, architect. The company's present plant has been acquired by the city, it being located on the line of a proposed boulevard. The new plant will have a capacity of at least two-thirds more than its present one, and will be so designed that it can easily be increased. Details of the plant, as well as to its further equipment in the way of power equipment and machinery, have not yet been fully decided upon.

The Atlantic City Railroad Company, Camden, N. J., is taking bids on private plans for the erection of an engine house to be built in that city. It is to be one story, 160 x 65 ft., and constructed of brick. Details are not available.

Joseph F. Hasskarl, acting director, Department of Wharves, Docks and Ferries, Philadelphia, will receive bids until May 26 for furnishing and installing a 6 cu. yd. clam shell bucket on the dredge Schuylkill. Specifications may be obtained at his office, 555 Bourse Building.

Cincinnati

CINCINNATI, OHIO, May 23, 1911.

A local railroad official calls attention to a very significant fact in the movement of freight at the present time, as reflecting the condition of business in almost every manufacturing line. Carload freight has shown a falling off, while less than carload shipments have increased nearly 300 per cent., an indication that only hand-to-mouth buying is being done to fill urgent immediate requirements. This is especially true in the machine tool line, so far as domestic business is concerned, but foreign orders received are more satisfactory. Curtailment in operating expenses is being quietly continued, although the outlook is really brighter than it has been for some time.

Sawmill and woodworking machinery shows considerable improvement. The South continues to furnish its quota of business, but the new betterment reported is from other sections of the country, including especially western territory.

Steam power plant equipment is in a little better demand, but prices have been shaved so close that when bids are called for on the larger units of engines and boilers they are all practically the same figure.

The Hooven, Owens, Rentschler Company, Hamilton, Ohio, is shipping to the city of Peru, Ind., two 16 x 34 x 42 in., cross-compound, Corliss engines, that

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are to be direct connected to 350-kw. Fort Wayne generators.

Among late orders of the Long & Alstatter Company, Hamilton, Ohio, is one for a large billet shear to cut 4 x 4 in. billets to be shipped to the National Tube Company, Youngstown, Ohio. An order has also just been received from the Japanese government for a large gate shear to be installed in a navy yard.

A company is being formed to erect an ice plant at Fort Thomas, Ky. The new company will be known as the Fort Thomas Ice Company. W. B. George and Harry Stegeman are understood to be the main promoters.

To serve the machine tool interests located at Oakley, Cincinnati suburb, the Baltimore & Ohio Railroad is erecting a large concrete depot at that point.

The Ohio Universal Truck Company has been incorporated at Warren, Ohio, with $200,000 capital stock. The principal incorporators are George T. Fillius, Z. F. Craver, O. R. Grimmesey and W. R. Hostetter.

The municipality of Oxford, Ohio, has definitely decided to erect a large water-works plant.

J. H. Renshaw, dean of the Cincinnati Continuation School, delivered an address before the Chicago Branch, National Metal Trades Association, May 16, on the subject of industrial education in Cincinnati.

In addition to improvements already made at its Cincinnati terminus, the Chesapeake & Ohio Railroad Company has decided to electrify its line from Newport to Melbourne, Ky. At the latter place large repair shops are now nearly completed. A large freight depot will also be built in Newport.

The J. R. Stevens Company, Cincinnati, has been awarded contract for building a large whiskey storage building at Lawrenceburg, Ind., for James Walsh & Co., Cincinnati. The building will be of regular warehouse construction, 100 x 100 ft., ten stories. A good-sized hot-water heating plant will be installed.

It is reported that the Republic Motor Car Company, Hamilton, Ohio, will enlarge its plant, and that some equipment will be purchased at an early date.

The property of the bankrupt Ohio Sterling Company, Dayton, Ohio, will be sold at public sale June 14 at 10 a.m., by W. F. Smith, auctioneer, 716 Reibold Building, Dayton. The property comprises a foundry and an electrical department. The foundry is equipped with a cupola having a melting capacity of 12½ tons per hour and is adapted to making both heavy and light castings. It is complete in every respect, all appliances being modern. The electrical department is equipped with a large number of machine tools. It has designs and patterns for building motors ranging in size from one-sixth to 30 hp. The capacity is at least 100 motors a month. The property will be sold as a whole or separately, according to the preferences of purchasers.

Chicago

CHICAGO, ILL., May 23, 1911.

The most encouraging feature of the Chicago market is the large railroad requirements now before the machinery trade. The past week the Santa Fé gave out a list approximating about $25,000, which is in addition to the list it has had out for some time and which it is now closing. Other lists of importance issued the past week are that of the Illinois Central Railroad for about $15,000 worth of machinery and that of the International Harvester Company for a like amount for its Milwaukee Works. A few tools are also being purchased by the Chicago, Rock Island & Pacific Railroad. Recent reports of renewed activity in the automobile industry throughout the West seem to have been well founded. Many of the dealers report a good volume of inquiries, though a very small proportion result in sales.

The Searchlight Gas Company, 1124 Michigan avenue, Chicago, will erect a factory at Omaha, Neb., during the present summer.

The Commercial Electric Motor Mfg. Company, Chicago, has increased its capital stock to $50,000 for the purpose of making improvements.

The Tri-City Pattern & Machine Company, which has been doing a general pattern and machine business at Moline, Ill., and the Reynolds Machine Company, of the same city, manufactuer of screw driving machines and gear hobbing machines, have been consolidated and will hereafter be known as the Reynolds Pattern & Machine Company. Both lines will be continued and several new machines will be added. The business of the company will be conducted in the building formerly occupied by the Tri-City company.

The City Council of Paris, Ill., is considering extensive improvements to its electric light plant.

The Crete Mfg. Company, Crete, Ill., has been incorporated with $2,000 capital stock to manufacture electric automatic machines.

The Duluth Casket & Undertaking Supplies Company, Duluth, Minn., has awarded a contract for the construction of a new factory building, 50 x 100 ft., which it will equip with modern machinery, estimates for which are now being received.

Duluth, Minn., is having plans and specifications prepared for a municipal lighting plant at an estimated cost of approximately $700,000. Construction work will not be commenced at the present time, however, as the matter will have to be submitted to a vote of the people.

The Segerstrom Piano Mfg. Company, Minneapolis, Minn., is preparing plans for a factory which it will erect at Menominee, Wis., containing 50,000 sq. ft. of floor space, of brick construction. Two freight elevators and a boiler for heating purposes will be required. All machinery will be operated by individual motors. The building will be equipped with ventilating fans and sprinkling system.

The Everhart-Delaney Company, Oskosh, Wis., recently incorporated with $150,000 capital stock, has commenced work on the construction of a drop forging plant, 40 x 90 ft., one story, which it expects to have ready for operation about June 15. Charles M. Delaney is president of the company.

The William J. Hess Iron Works, Green Bay, Wis., has been organized to manufacture gasoline engines, boilers, structural iron work and to do general brass and iron foundry work, besides job and repair work of all kinds. The company has taken over an existing plant and will be in the market for boring mills, engine lathes, both new and second-hand, planer and turret lathes, shears, punches and boiler makers, and foundry tools, one 12 or 14-in. Corliss engine and boiler, one 60 to 100-kw., direct-current, 110-volt generator and a number of 5 to 15-hp. motors and air compressors.

The Northwestern Malleable Iron Company, Milwaukee, Wis., is erecting an addition to its plant at a cost of $40,000.

The new repair shops of the Milwaukee Electric Railway & Light Company, Milwaukee, Wis., are now practically completed. The building is of fireproof construction, 180 x 370 ft., two stories.

Plans and specifications for the new factory buildings of the Aluminum Goods Mfg. Company, Manitowoc, Wis., have been completed, and bids for their erection are now being received. The main building will be 47 x 290 ft., three stories, of fireproof construction.

Kadoka, S. D., is planning to install a water-works system at a cost of $6,700.

The Christopher & Simpson Architectural Iron & Foundry Company, St. Louis, Mo., has purchased land adjoining its plant to provide for future extension.

Homan & Newman, Belton, Mo., will install an electric light plant in the city of Belton.

The Ideal Rotary Hog Feeder Company, Miami, Okla., is erecting a factory, work upon which will be rushed to completion as rapidly as possible.

The Vinita Machine & Mfg. Company, Vinita, Okla., newly incorporated, is erecting a 40 x 60 ft. cement block building with cement floor. It is the expectation of the company that an addition will shortly have to be made, as business in that section of the country is developing rapidly. For the present the repairing of engines, boilers and farm machinery will be conducted, together with pipe cutting, oxy-acetylene welding, etc. The company, however, desires to engage in manufacturing, and will therefore consider propositions from those having articles that can be made in a machine shop. The machinery required has partially been arranged for, and it is expected that the plant will be ready for operation about the middle of July. W. C. Drake is president; H. M. Burroughs, vice-president, and James A. Kenreigh, secretary, treasurer and general manager.

Indianapolis

INDIANAPOLIS, IND., May 23, 1911.

A new foundry and machine shop will be erected during the coming Summer at Aurora, Ind., by the Steadman Foundry & Machine Works, manufacturer of crushing, grinding and mining machinery.

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The company will be in the market for a complete equipment for both departments.

The La Fayette Electric & Mfg. Company, La Fayette, Ind., incorporated with $200,000 capital stock, has purchased the plant and equipment of the Sterling Electric Company of that city and will continue the manufacture and sale of all telephones and electrical appliances heretofore manufactured by the Sterling company. The company has also arranged to manufacture an electric brake patented and owned by the Electric Safety Brake Company, Cincinnati, Ohio. No additional buildings are contemplated at the present time, but the company will probably be in the market for new equipment.

The Indiana Rolling Mill Company, New Castle, Ind., advises in regard to the recent fire at its plant that its shovel factory was completely destroyed, with a loss of about $125,000. Preparations for rebuilding the plant will be commenced immediately.

The S. J. Gardner Foundry & Machine Company, New Albany, Ind., has taken over the plant of S. J. Gardner. Two new buildings have been completed, a foundry 50 x 120 ft. with two cupolas and two five-ton traveling cranes, and a sheet iron and boiler repair shop 60 x 120 ft. A machine shop 50 x 120 ft. was built and equipped a year ago. The company was recently incorporated with $50,000 capital stock.

Daniel T. Olds, of Bacon, Olds & Co., Indianapolis, which company purchased the Citizen's Heat & Light Company, Elwood, Ind., at receiver's sale, states that the natural gas plant will be remodeled for the furnishing of artificial gas, at a cost of $100,000.

The Stutz Auto Parts Company, Indianapolis, is building a two-story reinforced concrete addition, costing $15,000.

The final report of C. A. Ford, receiver for the Atlanta Tinplate Company, Atlanta, Ind., has been made to the Circuit Court at Noblesville, Ind., and approved. It winds up litigation extending over five years. The stockholders received 97 per cent, which is regarded as a good showing.

Martin T. Krueger has been appointed receiver of the Western Launch & Engine Company, Michigan City, Ind., manufacturer of launches and launch engines. The assets are $50,000, much of it in raw material; the liabilities, $10,000.

The King Iron Bridge Company, Cleveland, Ohio, secured the contract for a bridge over Big Blue River, between Shelby and Johnson counties, Indiana, for $10,000.

The William F. Meyers Diamond Saw Company, Bedford, Ind., has been incorporated with $6,000 capital stock, to manufacture saws for cutting stone. The directors are William F. Meyers, V. A. T. Albright and G. V. Albright.

The Parkhurst Die Casting Machine Company, Anderson, Ind., has been incorporated with $100,000 capital stock. The directors are L. M. Parkhurst, W. T. Durbin and W. N. Durbin.

The Ideal Concrete Machinery Company, South Bend, Ind., has increased its capital stock by the addition of $200,000 preferred and $300,000 common.

The Muncie Electric Lighting Company has been incorporated at Muncie, Ind., with $1,000,000 capital stock. It is a merger of the lighting companies of Hartford City, Redkey, Dunkirk, Eaton and Muncie. The directors are H. L. Finley, F. P. Hunter, M. B. Smythe, F. W. Drager, A. H. Melton and F. B. Kiel.

The Elkhart Musical Instrument Company, Elkhart, Ind., has been incorporated, with $10,000 capital stock, to manufacture musical instruments. The directors are W. J. Gronert, W. C. Reid and B. H. Reid.

The S. S. Cox Show Case Company, North Manchester, Ind., has been incorporated with $65,000 capital stock, to manufacture show cases. The directors are S. S. Cox, A. A. Ulrey, G. L. Shoemacher, George Burdage, J. A. Browne, John Isenbarger and F. S. Gleason.

The Klamer-Goebel Furniture Company, Evansville, Ind., has been incorporated with $60,000 capital stock, to manufacture furniture. The directors are Oscar Boetticher, Daniel Wedtz, John Kissel, O. A. Klamer and H. W. Goebel. The company is preparing plans for a new factory building.

The Connersville Furniture Company, Connersville, Ind., has increased its capital stock from $75,000 to $200,000.

The Broderick Boiler Company, Muncie, Ind., is planning to double the capacity of its plant. It now employs 175 men.

The Staples-Hildebrand Company, South Bend, Ind., has been incorporated with $100,000 capital stock, to deal in builders' supplies. The directors are G. D. Staples, W. M. Hildebrand and C. E. Staples.

The Ward Fence Company, Decatur, Ind., is preparing to build a large addition to its plant, the main building to be 200 ft. long. The company has just completed a very busy season.

The Huntingburg Furniture Company, Huntingburg, Ind., has been incorporated with $25,000, to manufacture furniture. The directors are E. B. Fish, George D. Brown and H. A. Gabriel.

Cleveland

CLEVELAND, OHIO, May 23, 1911.

The local machinery market has been somewhat quieter the past few days than the previous week. Very few new inquiries came out except for single tools. The trade is apparently being affected somewhat by the unusually hot weather that prevailed for the greater part of the week. Sales were limited almost entirely to small single tools. Dealers will soon have a chance to figure on the machinery requirements for the new West Side Technical High School in Cleveland. This list has been prepared and includes about 100 machine tools, in addition to considerable other equipment. This list, together with that of the American Steel & Wire Company, will do considerable in stirring up some activity in an otherwise rather quiet market. The demand for second-hand machinery is only moderate.

The machine tool list for the West Side Technical High School in Cleveland has been completed and will be sent to the trade in a few days or as soon as complete specifications are prepared on a few of the tools, the sizes of which have not yet been definitely decided upon. The equipment will be purchased shortly for delivery during the fall, when it is expected that the school will be completed. The list as follows:

Machine Shop Equipment

Two motor-driven direct-current engine lathes.
One tool-room engine lathe with quick change gear mechanism, compound rest, taper attachment, draw-in collets and relieving attachment.
Twenty-four engine lathes, belt feed, compound rests, with taper attachments.
Twenty engine lathes with compound rests.
Seven 10-in. speed lathes.
One turret lathe, 1¼-in. spindle.
One universal tool and cutter grinder.
One universal grinder.
Two 20-in. drilling machines, stationary heads, wheel and lever feed.
One 20-in. drilling machine with sliding head band and power feed, automatic stop motion and tapping attachment.
Three sensitive and spindle drill presses.
Two arbor presses.
Two twist drill grinders.
Five 14-in. shapers.
Two plain milling machines with indexing head.
Two universal milling machines, one with universal vertical spindle attachment.
Two tool grinders, wet, two wheel.
Two bench grinders.
Two portable electric center grinders.
Two power hack saws.
One gas furnace.
One planer.

Forge Shop Equipment

Twenty-nine forges.
Twenty-nine anvils.
Twenty-nine anvil blocks.
Two hundred and twenty-two tongs.
Thirty-six hardies.
Fifty-three each top and bottom swedges.
Twenty-five each top and bottom fullers.
Seventy-two hammers.
One power shear.
Twelve sledges.
Four galvanized iron tanks.
One upright drill and counter.
Twelve jaw bench vises.
Thirty-six malleable iron melting ladles.
One adjustable hack saw frame.
One emery wheel stand and counter.
Two emery wheels.
One power hack saw.
One heating furnace.

For the pattern making and cabinet shop 19 wood-working lathes will be required. There will also be purchased a complete foundry equipment for 112 hands. This will include a 24-in. cupola, molding machines, tumbling barrel, etc. In addition to the above list a large number of small tools will be purchased for all of the departments.

The Globe Machine & Stamping Company, Cleveland, has completed one building of its new plant on the west side near the plant of the Standard Welding Company. This building is a steel automobile box factory. It is 100 x 165 ft. and one story. There is a japanning room in connection. The company has started

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work on its main building, which will be 116 x 250 ft. It will be two stories with a monitor roof. Its construction will be concrete. The two buildings will provide about 55,000 sq. ft. of floor space. The machinery will be driven by motors in the group plan. About 20 motors will be required in 5, 10 and 20 hp. Electricity will be furnished by a commercial company, so that a power plant will not be built.

The Westman Motor Truck Company, Cleveland, recently incorporated wth a capital stock of $200,000, has purchased the plant formerly owned by the Horton Mfg. Company in Painesville, Ohio, and will at once equip it with machinery for the manufacture of motor trucks.

The Graton & Knight Mfg. Company, Worcester, Mass., oak leather tanner and belt maker, has purchased the business and plant of the Republic Belting Company, Prospect avenue and West Third street, Cleveland, which recently went into the hands of a receiver. The purchasers will operate the Cleveland plant as a branch factory. James D. Thompson will be the local manager.

The Board of Trade, Mingo, Ohio, has closed a deal with Cleveland parties, represented by J. V. Kennedy, for the building of a new brass and iron foundry in Deandale, near Mingo. The plant will be operated under the name of the Ohio Valley Brass & Iron Company. It is expected that the erection of the plant will be started shortly and that it will be ready for operation in four months.

The Massillon Wire Basket Company, Massillon, Ohio, has been incorporated with a capital stock of $25,000 by John E. Johns, C. E. Schworn, Martin B. Schultz, Andrew Reese and G. W. Kratsch.

The Safe Cabinet Company, Marietta, Ohio, will enlarge its plant by the erection of a two-story addition, 64 x 96 ft., and a one-story factory building, 28 x 182 ft. The extensions will enable the company to nearly double its present output. The company has broadened its line of products and is now engaged quite extensively in the manufacture of steel furniture.

The Gasselli Chemical Company, Cleveland, has acquired a site in Canton, Ohio, and will build a branch plant in that city for the manufacture of chemicals.

The Conductor Fitting Company is the name of a new concern in Marietta, Ohio, that has commenced the erection of a plant for the manufacture of conductors and stamped steel fittings. Ben T. Seyler will be the manager.

The Belmont Stamping & Enameling Company, New Philadelphia, Ohio, will enlarge its plant by the erection of a brick and steel addition.

The Wellman Pattern Supply Company, Cleveland, has increased its capital stock from $30,000 to $50,000.

Detroit

DETROIT, MICH., May 23, 1911.

The past week has been active in all lines, with the exception of the railroad equipment concerns and stove manufacturers. Automobile orders and trade continues unabated, with more orders on hand than can be taken care of in the next few months. The Buick plant at Flint is experiencing heavy trade, with sufficient orders on file to keep it running all summer. Building is active, with a number of new factories to be built, as well as two office structures.

One of the most important deals brought about in some weeks is the purchase by Schwanbeck Bros. of 12 acres of land in the northeastern part of the city for the erection of a $200,000 plant. They are manufacturers of showcases, special baking machinery, and knockdown shipping boxes, and are one of the oldest concerns in the city. The manufacturing building will be 62 x 500 ft., four stories, and will be constructed of brick and steel. With it are to be three quick-acting dry kilns, with capacity of 25,000 ft. daily. There will be a separate power plant, to be equipped with a 300-h. p. Corliss engine, also an electric plant, as some of the machinery will be driven by motors. The capital stock will be increased from $80,000 to $300,000.

Detroit is to be one of the manufacturing points for the Augustine types of rotary engines. A company is being formed to demonstrate the use of the engine in household duties with a view to securing sufficient capital to erect a suitable plant. Thomas W. Brown has the matter in hand.

The Studebaker Corporation is planning the erection of several new buildings. The matters are in the hands of the architects, who are letting the first contracts towards the construction work.

The Fisher Body Company, maker of automobile bodies, has plans in the hands of architects for the construction of a new factory addition to care for its increasing business. The plant will cost in the neighborhood of $10,000.

The Detroit Corrugating Company is a new sheet-iron and metal concern organized this week. The company has filed articles of incorporation with a capital stock of $25,000.

The Watt Carburetor Company, manufacturer of carburetors for motor vehicles, filed articles of incorporation with the secretary of state last week. The company will start business with a capital stock of $150,000.

The Holland Rusk Company, Holland, Mich., has increased its capital stock from $50,000 to $100,000.

The Durfee Embalming Fluid Company, Grand Rapids, Mich., will build a new plant three times the size of its present four-story building. The company manufacturers specialties as well as fluids.

The plant of the Valley City Biscuit Company, Grand Rapids, Mich., was partly burned May 18. The loss will reach close to $20,000. Practically all the machinery as well as some stock was destroyed.

The woodenware factory recently destroyed at Kalkaska will be re-established at Munising, Mich., by L. W. Beebe, secretary of the company.

The Terrel Equipment Company, Grand Rapids, Mich., suffered the loss of its plant by fire last week. The loss will reach $50,000, fully insured. The company is building a new plant now, and the fire will no doubt hasten the construction. The machinery item will necessarily be much larger now, owing to the fire.

The Hayes Wheel Company, Jackson, Mich., one of the largest auto wheel concerns in the state, has voted to increase its capital stock from $30,000 to $100,000 for the purpose of expansion.

The plant of the Standard Pure Food Company, Owosso, Mich., was burned May 17. The insurance on the stock and machinery is $25,000.

The taxpayers of Mancelona will vote May 22 on a bond issue of $8,000 for water works improvements.

The citizens of Three Rivers, Mich., have voted the issuance of bonds for $40,000 to purchase the Emery Water Power, and install an electric lighting system.

The New England Pie Company, following increases made by other baking concerns of this city, will increase its capital stock from $50,000 to $100,000. The added capital will be used to enlarge the plant and purchase more modern baking machinery.

The Green & Wilson elevator at Deckerville, Mich., will be remodeled and its capacity increased to 50,000 bushels.

The saw mill of Fred Nelson, at Maple Ridge, Delta County, Mich., recently burned, will be rebuilt.

The Big Rapids Gas Company, Big Rapids., Mich., is planning extensive improvements in the near future, which will involve the expenditure of about $10,000.

The Muskegon Steel Castings Company, Muskegon, Mich., has let the contract for the construction of an addition, which is to be completed by July 1. The Toledo Iron & Bridge Works secured the contract for the steel framework.

The Muskegon Crank Shaft Company will remove to Lansing, Mich. The move has been contemplated for some time, and comes as the result of work on the part of the Lansing Business Men's Association. The company will occupy a building owned by the Seager Engine Works.

The Michigan Bow Socket Company filed articles of incorporation with the secretary of State this week. The plant will be located in this city and will be another addition to the many auto accessory industries of this city. The company has a capital stock of $15,000.

The Huron Paper & Papeterie Company, Ypsilanti, Mich., has increased its capital stock from $15,000 to $50,000. The added capital is needed to buy new machinery.

A factory for the manufacture of wood-fibre packing boxes will probably be organized at Niles, Mich. The matter has been hanging fire for nearly two years. The Niles Board of Trade has particulars.

The Farmers' & Gleaners' Elevator Company has been organized at Elkton, Mich., with a capital stock of $30,000. It is planned to build a large elevator at Elkton.

Representatives of the Commonwealth Power Com-

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pany, Lansing, Mich., are negotiating for the purchase of the old water-power system at Petreville, near Eaton Rapids. The company plans to tear down the old dam and replace it with a new concrete structure, and will establish one of the most modern water-power systems on the Grand River.

L. H. Shepard, Charlotte, Mich., has under contemplation the erection of a modern cooling and abbatoir plant. It is also proposed to erect a building for the manufacture of fertilizer, in connection with the abbatoir.

The Antrim Chemical Company, Mancelona, Mich., has been taken over by the Antrim Iron Company, Grand Rapids. The purchaser will enlarge and modernize the plant and continue the business on a larger and much more important scale than under the old management.

There is a movement on foot in Kalamazoo, Mich., to establish a large and modern broom plant to employ about 30 men. The organization is barely under way and particulars are not made public. The promoters can be reached through the Business Men's Association.

A general manufacturing plant has been organized at Flushing, Mich., composed of citizens of the city. The company starts with a capital stock of $10,000. The Board of Commerce possesses particulars as to the incorporators.

The Mt. Clemens Milling Company, Flushing, Mich., has been incorporated with a capital stock of $30,000. A good-sized mill will be erected at once.

A new manufacturing concern of considerable importance to the city of Pontiac, Mich., is the F. J. Nice Furnace Company, incorporated this week. The company has a capital stock of $25,000.

The directors of Packard Motor Car Company, Detroit, Mich., have authorized new construction which will practically triple the capacity of its truck shops. Improvements to the foundry have also been authorized and this department will be increased by the addition of 9695 sq. ft. of floor space. Arrangements have also been made for building an additional floor on each of the two service buildings. The total floor space contemplated in the new construction is 160,295 sq. ft., which added to the present plant will increase the floor space of the plant to 37 acres. The additions will be of brick and reinforced concrete and will be completed as soon as possible. About $150,000 worth of new equipment will be purchased.

The South

LOUISVILLE, KY., May 23, 1911.

While lethargy is perhaps too strong a word to use in connection with the machinery situation, it is certainly true that the volume of sales has been considerably less than the dealers and manufacturers like to see recorded. There is hardly a line which is showing marked activity, while most of the general divisions are reported dull. There is a good deal of railroad buying in prospect in this territory, and that will help some.

Owing to the growth of the suburban residence idea in this part of the country, there has been a big field created here for complete electric light and water works plants for installation in large country homes. Through the Kentucky Bluegrass there are especially good prospects in this connection.

The Louisville & Nashville Railroad, W. H. Courtney, Louisville, chief engineer, has decided, according to semi-official reports, to double the power installation at its shops at New Decatur, Ala., and a considerable amount of equipment is being purchased. Boilers and electrical apparatus of large capacity will be purchased, it is stated.

The James Supply & Hardware Company, Chattanooga, Tenn., is having an exhibition this week of the marine engines and accessories of Fairbanks, Morse & Co. The exhibition will be held in Nashville next week.

The Axton-Fisher Tobacco Company, Louisville, which has purchased the business of the Crescent Tobacco Company, of Nashville, is planning the erection of a five-story factory and warehouse at Twentieth and Howard streets to take care of its enlarged business. The equipment will be purchased in the near future.

The Mengel Box Company, Louisville, has decided to erect a large factory at Winston-Salem, N. C., for the manufacture of tobacco boxes. The factory is for the purpose of supplying the plant of the W. R. J. Reynolds Tobacco Company, located at Winston-Salem. A large amount of power and wood-working equipment will be required. T. S. Hamilton, Louisville, is mechanical engineer of the company. Plans have not yet been completed.

The removal of the Alvey-Ferguson Company, Louisville, manufacturer of conveying machinery, to Oakley, O., a suburb of Cincinnati, will be accomplished in August, officers of the company have announced. The company has increased its capital stock from $50,000 to $300,000.

The John G. Duncan Company, of Knoxville, Tenn., is asking for prices on a 60-h. p. gasoline engine.

Two 2-ton electric elevators will be installed by the Chattanooga Feed Company, Chattanooga, Tenn. Equipment for a small grain elevator is also to be secured.

J. H. Holmes, Yuma, Tenn., is in the market for machinery for manufacturing cement blocks.

A bond issue of $40,000 has been approved by the voters of McKenzie, Tenn. The proceeds will be used for the extension of the electric light system.

Equipment will be installed in the plant of the Livingston Light & Power Company, Livingston, Tenn.

The Durham Coal & Iron Company, Chattanooga, Tenn., is planning considerable extensions, and is getting ready to open several new coal mines with a capacity of 1500 tons a day. Seventy-five additional coke ovens are also to be built. Plans for the construction of more iron furnaces have been held up for the time being.

The Knight-Weller Company, Knoxville, Tenn., which has a capital stock of $2,000,000, has announced ambitious plans for developing water-power sites in Tennessee and North Carolina, and for establishing plants for smelting iron ore by electricity. John C. Knight, Hotel Richmond, Washington, D. C., is interested.

A gasoline engine will be installed in the newspaper plant of G. G. Hyatt, Ducktown, Tenn.

In addition to the present water-power development on the Ocoee River, near Cleveland, Tenn., the East Tennessee Power Company has plans for the construction of a power-house near Ducktown, Tenn., where it is intended to develop 60,000 h. p. A dam, flume, etc., will be constructed following the completion of the present work.

The Lytle Electric Company, Memphis, Tenn., has been incorporated with $5,000 capital stock by P. W. Lytle, H. P. Woods and others.

George Tomlinson, Winchester, Ky., has purchased a spoke mill at Clay City, Ky., and will install wood-working equipment for the manufacture of hardwood flooring and interior finish.

The Cincinnati Gas Transportation Company, Cincinnati, O., is to build a natural gas plant, including a compressing station, at Maysville, Ky., and has let the contract for the erection of the building.

Considerable improvements are to be made in the plant of the Paducah Gas Company, Paducah, Ky. A tank of 200,000 cu. ft. capacity is to be erected, and the water-gas process will be substituted for the coal-gas method.

The Louisville & Nashville Railroad is planning a considerable expenditure at its shops at Evansville, Ind., which will be used by the Big Four when its extension from Evansville to Mt. Carmel, Ill., is completed. The shops will be greatly enlarged.

Bids will be received by the City of Eufaula, Ala., until June 7 for furnishing equipment for an electric light plant, including boiler, engines, generators, switchboard, transformers, condensers, etc. The engineers for the plant are the W. L. Upton Company, Birmingham.

Morgan City, La., is considering the installation of a water works plant.

Proposals will be received by the Board of Public Works of Nashville, Tenn, until May 30 for the installation of a boiler feed pump. George Beyer is superintendent of water works, and has the specifications in charge.

The Livermore Foundry & Machine Company, Memphis, Tenn., has removed its salesrooms and offices from 91 North Second street to 290 Adams avenue, thus grouping its heavy hardware and supply department with the manufacturing department.

A bond issue of $65,000, for the purpose of establishing an electric light plant and a water system, will be voted on June 5 at Greeneville, Tenn.

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Henry Vogt, president of the Henry Vogt Machine Company, of Louisville, is a member of a party of 100 business men of Louisville who are visiting Eastern Kentucky this week for the purpose of establishing closer business relations between Louisville and that section of the State.

The Westinghouse Company has completed the installation of equipment in the hydro-electric plant of the Watauga Power Company, on the Watauga River, near Bristol, Tenn., and the plant is to be put in operation.

The Duck River Power Company, the incorporation of which was recently noted, plans the development of water power at Manchester, Tenn., furnishing lighting service to that town being contemplated.

The new smoke-consumer ordinance adopted by the City Council of Knoxville, Tenn., will become effective June 1.

The city officials of Memphis, Tenn., are considering the establishment of a garbage disposal plant. Address Mayor Crump.

Dyersburg, Tenn., has voted favorably on the proposition to issue $30,000 of bonds for the purpose of making improvements in the electric light plant.

Eastern Canada

TORONTO, ONT., May 20, 1911.

To keep up its onward sweep the present wave of prosperity in Canada must continue to have the impulse of large capital importations. Great as are the productive operations of the country, the annual returns from them are not yet enough to keep up the pace. It takes much more money than what is yielded by the largest crops, by the greatest output of the mines, and by the returns from the forests, fisheries and other natural industries to keep the country in funds for the industrial activities that are now in progress. In other words, Canada is fixing capital much more rapidly than it is producing capital, and the deficit has to be made up by very large importations of capital brought in by thriving immigrants and as the proceeds of the sale of securities abroad. For a time it looked as if the marketing of the bonds, debentures and shares of Canadian Governments, municipalities and private corporations might be less active than it was. It is now evident that the quantity of money brought in from the outside will show no falling off for some time to come. New undertakings calling for very large applications of capital are being entered upon. Canada's credit keeps up in the British money market, and is attracting funds from France. Nearly every steamship brings over from Europe an agent of some financial house to study investment conditions here and to place large sums on good Canadian security. Altogether, financial conditions are assuring to the conductors of manufacturing industry, and give warrant for confidence on the part of those who have projects of expansion in mind. There is no hesitation in the placing of orders, and the demand for labor increases. At the same time competition is becoming keener. One hears much about salesmanship these days and Canada travellers and house salesmen are credited with holding their own against competitors from the United States, Britain, Germany and elsewhere.

The City Engineer has prepared estimates of the cost of constructing the proposed municipal addition to the street railroad system of Toronto. He places the cost at $505,000.

The retort plant of the Standard Chemical, Iron & Lumber Company at Sault Ste. Marie, Ont., was destroyed by fire on May 13. Five hundred men are thrown out of employment. This charcoal plant, which the company leased from the Lake Superior Corporation a year ago, has recently been very much improved.

The ratepayers of Aurora, Ont., have voted to confirm the agreement made between the Municipal Corporation and the Positive Clutch & Pulley Works, Ltd.

The Rhodes-Curry Company's mill at Little Forks, N. S., was destroyed by fire on May 16, with a loss of $25,000. The mill had been recently equipped.

Sir Donald Mann, vice-president of the Canadian Northern Railway Company, whose bonds for the building of the stretch of road between Port Arthur and Montreal have just been guaranteed to the amount of upward of $35,000,000 by the Dominion Government, says that the company will at once begin an expenditure of about $31,000,000 on terminals at the latter city. The work there will include the building of a bridge across the St. Lawrence to connect with the Intercolonial at St. Rosalie. The company has also awarded contracts for the completion of its line, 250 miles in length, between Toronto and Ottawa.

The Canadian United Electric Company, with a capital stock of $75,000, and head office in Montreal, has been incorporated as a Dominion enterprise.

The Dominion Flour Mills, Ltd., has been incorporated as a Dominion company, with a capital stock of $1,500,000, and head office in Montreal.

American Machinists, Ltd., with capital stock of $50,000, and principal place of business at Montreal, has been incorporated as a Dominion company.

The Commercial Engineering Corporation, with a capital stock of $100,000, and chief place of business to be in Montreal, has been incorporated as a Dominion company.

The Cockshutt Plow Company, Ltd., has been incorporated under Dominion letters patent, with a capital stock of $15,000,000 to take over the business of the company that has long been operating under the same name in Brantford, Ont. Brantford is still to be the point at which the chief place of business will be located. The charter gives the company authority to manufacture harvesting machinery, engines, boilers, etc., as well as plows. Harry Cockshutt, managing director of the Cockshutt Plow Company, whose business is to be taken over, says that there is no merger of any kind contemplated, and it is said that control of the new company will remain in the hands of the group controlling the old one. It is announced from London, England, that the Western Canada Trust Company will shortly offer $3,750,000 7 per cent cumulative preferred stock in the Cockshutt Plow Company. It is remarkable how the business of manufacturing farm implements is expanding in Canada. The Massy-Harris Company is increasing its capacity in Toronto and Brantford. The International Harvester Company is enlarging its operations in Hamilton. The Oliver Plow Company is putting up a great plant in that city. The Deere Company is establishing great agricultural implement works in Welland, and now the Cockshutt Plow Company's works in Brantford are to have their capacity immensely increased.

The Tariff Committee of the Canadian Manufacturers' Association advises the Executive Committee of that body that it has received advices to the effect that the conditions of the Government's contract for the building of vessels for the Canadian navy call for the construction of the hulls, the propelling engines and the boilers must be done at works established in this country, and that the materials and machinery used in the building and equipment of these works must also be the product of Canadian industry,—that is, in every case possible, and where impossible, must be produced within the Empire.

The ratepayers of Trenton, Ont., have approved a by-law to grant a fixed assessment to the Canadian Iron Mines Company, a new corporation with a capital stock of $1,500,000, which is to establish a concentrator plant in the town at a cost of $100,000. The concentrator is to be operated by electricity supplied by the Seymour Power Company.

The Madison Williams Foundry Company, Lindsay, Ont., has obtained the contract to put in the turbine and pumps for the Smith's Falls waterworks. Among the tenderers were some United States manufacturers.

Work has been begun on the fertilizer plant of Alexander Cross & Sons, Sydney, N. S. The Rhodes-Curry Company have the contract.

The contract for the construction of a bridge over the St. Charles River, to join the city of Quebec and the suburb Limoilou, has been awarded by the corporation of the former municipality to F. Lemoine & Son, Montreal, the price being $156,200.

The Chatham Malleable Iron & Steel Mfg. Company has begun the construction of its works in Chatham, Ont.

The Lott Lawn Fence Company has begun business in Sarnia, Ont.

The Yale & Towne Mfg. Company, which contemplates establishing at St. Catharines, Ont., an extensive Canadian plant, has received the unanimous endorsement of the St. Catharines Board of Trade favoring exemption from taxes for a term of years and other privileges providing the branch plant is located there.

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The Russell Motor Car Company, Ltd., is the new name for the Canadian Cycle & Motor Company, Ltd., Toronto. Coincident with the change of name the company increased its capital stock from $800,000 to $1,600,000 to provide additional manufacturing and selling facilities.

Western Canada

WINNIPEG, MAN., May 20, 1911.

All Western centers are feeling and showing the stimulus of the great immigration movement, of the large capital expenditures of the railway companies in new construction, and of the promising crop conditions. Eastern manufacturers are putting up large warehouses at distributing points, and a very large business in harvest machinery, outfit, etc., has been booked for later delivery.

Engineers of the Dominion Public Works Department estimate that the construction of the drydock at Esquimault, B. C., in accordance with the plans of the Bullens of that place—with whom are to be associated Denny Bros., Dumbarton, Scotland—will cost $2,637,800. The company in which these interests are joined, and to which the government subsidy of 3½ per cent. on the capital cost will be paid for 35 years, is the Esquimault Paving Dock & Shipbuilding Company.

The Otis Elevator Company, Toronto, has begun the construction of large offices and salesrooms in Vancouver, B. C. The building is to cost $100,000. A warehouse is also to be built in that city by the Otis Company at a cost of $50,000.

The Canadian Fairbanks Company, Montreal, maker of scales and weighing machines, is to built a $250,000 warehouse in Vancouver, B. C., next year.

Last month the Fraser Mills, New Westminster, B. C., cut 10,000,000 ft. of lumber. The lumber business in Canada's Pacific coast mills is of larger volume than it ever was.

The Consolidated Land & Machinery Company, with head offices at Minneapolis, is to open a branch at Edmonton, Alberta.

The East Calgary Corporation, Calgary, Alberta, is about to apply for a charter to build six or eight miles of electric railroad.

It is stated that the firm of Morris & Co., Chicago, of which the Dominion Meat Company is an offshoot, will build a $1,000,000 packing plant in Calgary, Alberta.

The Cockshutt Plow Company, Brantford, Ont., has applied to the municipal authorities at Regina, Sask., for two blocks for a warehouse site. Goulds, Shapley, Muir & Co., Brantford, Ont., maker of traction engines, pumps, etc., have applied to the same authorities for a warehouse site. The Alaska Bedding Company, Winnipeg, proposes to build a warehouse in Regina. The Dominion Linseed Oil Company, Braden, Ont., has been seeking the same site. The Gus. Peck Company, manufacturer of well-boring machinery, is seeking a warehouse site from the municipal authorities in Regina.

In the Dominion Government's supplementary estimates is an item of $2,000,000 for the beginning of construction of the Hudson Bay Railway as a government work.

With a capital stock of $150,000, a company headed by a number of Calgary, Alberta, men has been granted letters of incorporation by the Provincial government in order to erect a nail factory there. Application has been made to the City Council for special privileges and a site. In the personnel of the company are W. E. Davies, John Henry Rue, York Shaw and W. J. Morris. The establishment, for which plans and specifications have been drawn up, will have a capacity of 14 tons per day, and the output will include a full line of nails of various sizes, also builders' hardware, horseshoes, tacks, brads, etc. The plant will be equipped with automatic machinery. For the present all the raw material will be imported from the East.

The Munro Steel & Wire Works, Winnipeg, will erect a branch factory in Vancouver this year. The plant will be mainly devoted to the manufacturing of wire fencing, by a new machine invented by James Munro.

McGurk & Sutton have started a sheet-metal shop at North Vancouver, B. C.

John M. Fleming, Ottawa, Ontario, inventor of the Fleming grate bars, is organizing a company at Calgary, Alberta, for the manufacture of furnaces, ranges and grate bars.

The capital stock of the Vulcan Iron Works, Ltd., Winnipeg, has been increased to $500,000.

The contract has been let for the building for the paint factory to be established in St. Boniface, Man., for the Martin-Senour Company, which has factories in Chicago, Boston and Montreal.

The Canada Cement Company, Ltd., Montreal, is preparing to erect a plant in Winnipeg to take care of the company's Western business. Senator Edwards, president of the company, has been in Winnipeg arranging details.

John Scott, a New Brunswick millman, has gone to British Columbia with a portable sawmill outfit which he will establish on the Nechaco River near Fort George. If business warrants he will erect a modern plant next season.

The sawmill of the Doukabour colony at Tarry Siding, on the Kootenay River, B. C., was burned recently, causing a loss of $16,000. It will be rebuilt at once.

The Penticton Lumber Company, Penticton, B. C., will shortly add a wood pipe and box factory to its new mill at that point.

The British Canadian Lumber Corporation, Ltd., has selected a large site on Lulu Island, within the bounaries of New Westminster, B. C., to erect a sawmill. The plant wil be run by electricity, and will be modern in every way. A sash and door factory will also be installed.

The Electric Light Company, South Quappelle, Sask., contemplate erecting a more substantial powerhouse, and also installing gasoline power.

By-laws for the construction of an electric light plant have been carried by the ratepayers of Melville, Sask.

An agreement with James H. Preston for the location of a planing mill at Medicine Hat, Alberta, has been ratified by the council of that city.

McDougal-Jenkins, Ltd., engineers, have purchased the plant of the Albion Iron Works, North Vancouver, B. C. They will erect another shop costing about $150,000.

The Pacific Coast

SAN FRANCISCO, CAL., May 16, 1911.

The buying movement in machine tools has fallen off to some extent in the last two weeks, and the market at present is rather quiet, though there is still more demand than for some months prior to March.

The moderate demand for heavy tools which was noted a month ago is no longer a feature, and while there is some prospect of large inquiries arising later in the season business at present is limited almost entirely to small items. The demand for general shop equipment is fairly active, but the business is scattered over a large territory. Local shops, aside from those specializing on a few particular lines, have little work on hand, and there is no tendency to anticipate future needs.

Machinery of a general nature is also quiet. Aside from local conditions which tend to delay activity, a feeling of uncertainty regarding the tariff and other national matters is having its effect here, limiting the amount of capital invested in new industrial enterprises.

There is little inquiry for woodworking machinery, as few of the mills are running at full capacity. Some orders are being placed for logging equipment, however, and dealers still anticipate a fair movement in this line. While there is little definite inquiry for large mining outfits, considerable small equipment is being sold, and from the present scale of operations in several California mining districts a good season is expected. Oil well equipment is very quiet, with little prospect of any improvement this season. The most active demand is in connection with agriculture and irrigation work, the various pump, traction engine and implement factories being extremely busy.

At the invitation of the Pacific Coast Machinery Dealers' Association of San Francisco the machinery dealers of the coast met in San Francisco April 20 to 22. The problems facing the machinery dealers of the coast were discussed at this conference and an organization embracing all the machinery houses on the coast was organized. The following officers were elected: President, A. L. Young, A. L. Young Machinery Company, San Francisco; vice-president, Alexander Hamilton, Coldwell Bros., Seattle, Wash.; secretary-treasurer, H. H. Tracy, Tracy Engine Company, San

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Francisco. The executive committee, having the thorough organization of the Pacific Coast Machinery Dealers' Association in hand, is composed of the following well-known machinery men: Charles Stallman, Pacific Tool & Supply Company; C. A. Berger, Berger & Potter Company, San Francisco; J. M. Arthur, J. M. Arthur & Co., Portland, Ore.; Alexander Hamilton; Mr. Usher, Smith, Booth & Usher Company, Los Angeles, Cal.

The C. L. Best Gas Traction Company is having great success with its traction engines, and its steel casting department, represented here by Chas. P. Bannon, is well occupied with outside work.

The Doak Gas Engine Company has taken the Pacific Coast agency for the Bridgeport line of marine gasoline engines.

Charles C. Moore, president of Charles C. Moore & Co., engineers and machinery dealers, last week formally accepted the presidency of the Panama-Pacific International Exposition Company.

The Acme Brass Foundry Company has been incorporated at Los Angeles, with a capital stock of $30,000, by F. K. Czerniski, S. F. Margozewitz and N. C. Christensen, Jr.

The Standard Oil Company is erecting several large buildings at its Richmond, Cal., plant, one of which is to be used for a machine shop.

The Atchison Steel Post & Pole Company has been incorporated at Salt Lake City, Utah, with a capital stock of $1,000,000, by H. E. and M. E. Atchison, F. I. Gunnell and C. H. Valentine.

The supervisors of Los Angeles County, Cal., have accepted the bid of the Bucyrus Company for a steam shovel.

The Baker Machine Company, San Diego, Cal., will shortly erect a new shop building.

J. H. Smith, formerly of Oroville, Cal., expects to start a new machine shop at Eureka, Cal.

According to a report from Honolulu, T. H., the Standard Oil Company is preparing to build a large distributing plant at that city, to handle the business of the islands in that part of the Pacific. In addition to several large steel tanks, a can factory and box factory are mentioned as part of the project.

Plans are being drawn for a two-story office building for the Union Gas Engine Company at its plant in Oakland, Cal. Several other improvements are contemplated. In addition to a large amount of smaller work, this company is building a 200 hp. engine for a steel boat for the Standard Oil Company, the hull of which is being built by the United Engineering Company.

The California Alfalfa Meal Milling Company has let contracts for a large mill at Corona, Cal.

The Northern California Power Company is working on a new development project, involving the increase from 4000 hp. to 7000 hp. capacity of its plant at Kilare, Cal.

The town of Turlock, Cal., is investigating the expense of installing a municipal gas plant.

The Great Western Power Company has plans about complete for the installation of another unit in its large hydroelectric plant at Las Plumas, Cal., on Feather River. Four units are already in operation.

Frank Gurley, Mesa, Ariz., has placed an order with the United Iron Works, Los Angeles, for a 4-ton cold storage plant.

The California Eucalyptus Company has been negotiating with several towns in southern California for a site on which to erect a hardwood flooring plant, at a proposed expenditure of $20,000.

The manager of the municipal lighting plant of Pasadena, Cal., states that a new unit and steam engine will soon be needed, the estimated cost being about $30,000.

Some machinery of special design will probably be required this summer for the California Wine Association's plant at Winehaven, Cal. There has been some talk of putting in a machine cooperage shop, but it is not likely that this will be done.

Herbert E. Law, of San Francisco, whose name was prominently connected with the Western Steel Corporation, is connected with a new corporation, the American Safety Powder Company, with a capital stock of $5,000,000, which proposes to start a large factory. Antioch, Cal., is mentioned as the proposed location.

The Eastern Sierra Milling Company is preparing to start a new flour mill near Bishop, Cal.

A large ore reduction plant is to be erected this summer at the Arctic mine, near Washington, Cal.

The Llewellyn Iron Works, Los Angeles, has a contract amounting to about $50,000, for the installation of eight passenger elevators, freight and sidewalk elevators in a building at Fifth and Spring streets, that city.

The Bannon Engineering & Machine Company has taken the agency for the lines of the Climax Hoist Company and the Climax Machine Company, covering the Coast states, Nevada and Mexico.

The city of Oakland, Cal., will probably be in the market soon for a number of machines for street repair work.

Bids will be opened June 5 for a power plant and laundry machinery for the Los Angeles County farm.

The Winnemucca, Nev., Water & Light Company is preparing to erect a new plant, increasing the capacity of both departments.

Texas

AUSTIN, TEXAS, May 20, 1911.

The demand for various kinds of machinery in Texas and the Southwest shows an increase In New Mexico and Arizona a wonderful impetus is being given to the installation of irrigation pumping plants by the discovery that abundant supply of water may be obtained for the purpose by putting down shallow wells in many localities. An unusual briskness in the establishment of manufacturing plants is also noted.

W. P. Carmichael, of the Carmichael Construction Company, St. Louis, Mo., will submit a proposition to the City Commission of Austin for the reconstruction of the dam across the Colorado River and the installation of a hydroelectric plant Grant Gornaday, president of the Midland Construction Company, Fort Scott, Kan., is also negotiating with the City Commission with the same object in view.

The Arkansas Fertilizer Company, Little Rock, Ark, contemplates establishing a fertilizer factory at some point in Texas.

The Kansas City Structural Steel & Iron Company has concluded the preliminary arrangements for the establishment of iron and steel works, to cost $200,000, at Houston. The plant will employ about 250 men.

The Darbyshire-Harris Iron & Machine Company will make additions and improvements to its plant at El Paso at a cost of about $1500.

Kohlberg Bros. have begun the erection of a cigar factory at El Paso to cost $25,000.

The Commercial Club of Aransas Pass, Texas, is promoting the establishment of a canning factory here W H. Emery and others were appointed a committee to have charge of the matter.

The city of Brownsville is installing a water filter plant at a cost of $20,000 Improvements to the electric light plant are being made There will also be erected a new slaughter house, bonds having been voted for the purpose.

The City Council of New Braunfels, Texas, has adopted the preliminary plans of the W. K. Palmer Company, Kansas City, Mo., for the construction of a large reinforced concrete dam across the Guadalupe River near here. The proposed dam will be for the purpose of affording the initial power for operating a large hydroelectric plant which the city will install.

Dr. M. M. Scott, who recently purchased the townsite of Owens, near Brownwood, will make extensive improvements to the property, including the installation of public utility plants.

Important improvements are to be made upon the 200,000-acre ranch of Charles P. Taft of Cincinnati, upon which the town of Catarina is situated. Large systems of irrigation will be constructed, public utility plants installed here and large industrial plants established. Plans have also been adopted for the erection of a hotel to cost $100,000.

The taxpayers, Yorktown, Texas, have voted $6000 of bonds for extending the distributing system of the water works plant.

W. D. Ellis and associates will erect a broom factory at Berclair, Texas.

The Lake Charette Land & Irrigation Company has been formed with a capital stock of $250,000 for the purpose of constructing a large system of irrigation near Springer, N. M. It is planned to reclaim about 10,000 acres. The incorporators are Woodford A. Matlock, of Denver, Col.; E. F. Bidwell, of Kinsley, Kan.; Amos L. Bennett, of Nickerson, Kan.; Merrick K. Edwards, of Denver; Charles F. Hortenstein and Charles E. Hartley, of Springer, and Edward Taylor, of Mullinville, Kan.

CURRENT METAL PRICES.

The following quotations are for small lots, New York. Wholesale prices, at which large lots only can be bought, are given elsewhere in our weekly market report.

IRON AND STEEL—

Bar Iron from Store—

Refined Iron:
1 to 1⅛ in. round and square.... ℔ 1.75¢
1⅛ to 4 in. x ⅜ to 1 in..... ℔ 1.75¢
1½ to 4 in. x ½ to 5-1..... ℔ 1.85¢
Rods—⅝ and 11-16 round and square. ℔ 1.85¢

Angles:	Cts. ℔ lb.
3 in. x ¼ in. and larger	2.00¢
3 in. x 3-16 in. and ⅛ in.	2.40¢
1½ to 2½ in. x ¼ in.	2.15¢
1½ to 2¾ in. x 3-16 in. and thicker	2.05¢
1 to 1¼ in. x 3-16 in.	2.15¢
1 to 1¼ x ⅛ in.	2.20¢
⅞ x ⅛ in.	2.30¢
¾ x ⅛ in.	2.35¢
⅝ in. x ⅛ in.	3.55¢
½ x 3-32 in.	4.60¢
Tees:	
1 in.	2.45¢
1¼ in.	2.30¢
1½ to 2½ x ¼ in.	2.10¢
1½ to 2½ x 3-16 in.	2.20¢
3 in. and larger	2.05¢
Beams	2.00¢
Channels, 3 in. and larger	2.00¢
Bands—1½ to 6 x 3-16 to No. 8	2.20¢
"Burden's Best" Iron, base price	3.15¢
Burden's "H. B & S." Iron, base price	2.95¢
Norway Bars	3.60¢

Merchant Steel from Store—

	per ℔
Bessemer Machinery	1.90¢
Toe Calk, Tire and Sleigh Shoe	2.50@3.00¢
Best Cast Steel base price in small lots	7¢

Sheets from Store—

Black,

	One Pass, Soft Steel.	C.R. Cleaned.	R. G.
No. 16	℔ 2.55¢	2.80¢	
Nos. 18 to 20	℔ 2.70¢	2.90¢	
Nos. 22 and 24	℔ 2.75¢	3.00¢	
No. 26	℔ 2.80¢	3.10¢	
No. 28	℔ 2.95¢	3.30¢	

Russia, Planished &c.

Genuine Russia, according to assortment ..... ℔ 12 @14½
Patent Planished, W. Dewees Wood ..... ℔ A, 10¢; B, 9¢ net

Galvanized

Nos. 12 and 14	℔ 2.95¢
Nos. 22 to 24	℔ 3.30¢
No. 26	℔ 3.50¢
No. 28	℔ 3.80

No 20 and lighter 36 inches wide, 25¢ higher.

Genuine Iron Sheets—

Galvanized

Nos. 22 and 24	℔ 5.75¢
No. 26	℔ 6.25¢
No. 28	℔ 7.25¢

Corrugated Roofing—

2½ in. corrugated.	Painted.	Galvd.
No. 24 ℔ 100 sq. ft.	$3.85	$4.80
No. 26 ℔ 100 sq. ft.	2.95	4.00
No. 28 ℔ 100 sq. ft.	2.60	3.75

Tin Plates—

American Charcoal Plates (per box)

"A.A.A." Charcoal:	
IC, 14 x 20	$6.65
IX, 14 x 20	7.90
A. Charcoal:	
IC, 14 x 20	$5.60
IX, 14 x 20	5.70

American Coke Plates—Bessemer—

IC, 14 x 20 ..... 107 ℔	$4.50
IX, 14 x 20	5.50

American Terne Plates—

IC, 20 x 28 with an 8 lb. coating	$8.70
IX, 20 x 28 with an 8 lb. coating	10.70

Seamless Brass Tubes—

List November 13, 1908. Base price, 18¢

Brass Tubes, Iron Pipe Sizes—

List November 13, 1908. Base price, 18¢

Copper Tubes—

List November 13, 1908. Base price, 21¢

Brazed Brass Tubes—

List February 1, 1911. 19¾¢ ℔

High Brass Rods—

List February 1, 1911. 14¼¢ ℔

Roll and Sheet Brass—

List February 1, 1911. 14¼¢ ℔

Brass Wire—

List February 1, 1911. 14¼¢ ℔

Copper Wire—

Base Price, Carload lots mill 13¾¢

Copper Sheets—

Sheet Copper Hot Rolled, 16 oz. (quantity lots) ..... ℔ 18¢
Sheet Copper Cold Rolled, 1¢ ℔ advance over Hot Rolled.
Sheet Copper Polished 20 in. wide and under, 1¢ ℔ square foot.
Sheet Copper Polished over 20 in. wide, 2¢ ℔ square foot.
Planished Copper, 1¢ ℔ square foot more than Polished.

METALS—

Tin—

Straits Pig ..... ℔ 45 @46

Copper—

Lake Ingot ..... ℔ 14 @14¼
Electrolytic ..... ℔ 13¾@14
Casting ..... ℔ 13¾@14

Spelter—

Western ..... ℔ 6¼@6¾

Zinc—

No. 9, base, casks.. ℔ 7¼¢ | Open.. ℔ 8¼

Lead—

American Pig ..... ℔ 5 @5¼
Bar ..... ℔ 6¾@6¾

Solder—

½ & ½, guaranteed ..... ℔ 27 @27½
No. 1 ..... ℔ 25 @25½
Refined ..... ℔ 22¾@23
Prices of Solder indicated by private brand vary according to composition.

Antimony—

Cookson ..... ℔ @10¾
Hallets @10¾
Other Brands @ 9¾

Bismuth—

Per ℔ $2.00@2.25

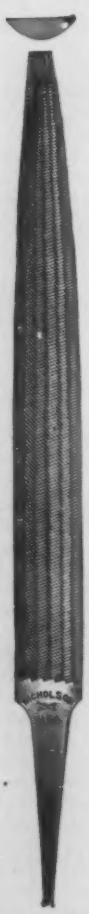
Aluminum—

No. 1 Aluminum (guaranteed over 99% pure), in ingots for remelting ..... 21¢ and 25¢
Rods & Wire ..... Base Price
Sheets ..... Base Price

Old Metals—

Dealers' Purchasing Prices Paid in New York.

	Cents.
Copper, heavy and crucible	10.50 to 10.75
Copper, heavy and wire	10.25 to 10.50
Copper, light and bottoms	9.25 to 9.50
Brass, heavy	7.00 to 7.25
Brass, light	5.50 to 5.75
Heavy machine composition	9.00 to 9.25
Clean brass turnings	6.75 to 7.00
Composition turnings	7.75 to 8.00
Lead, heavy	3.75
Lead, tea	3.50
Zinc, scrap	4.00



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